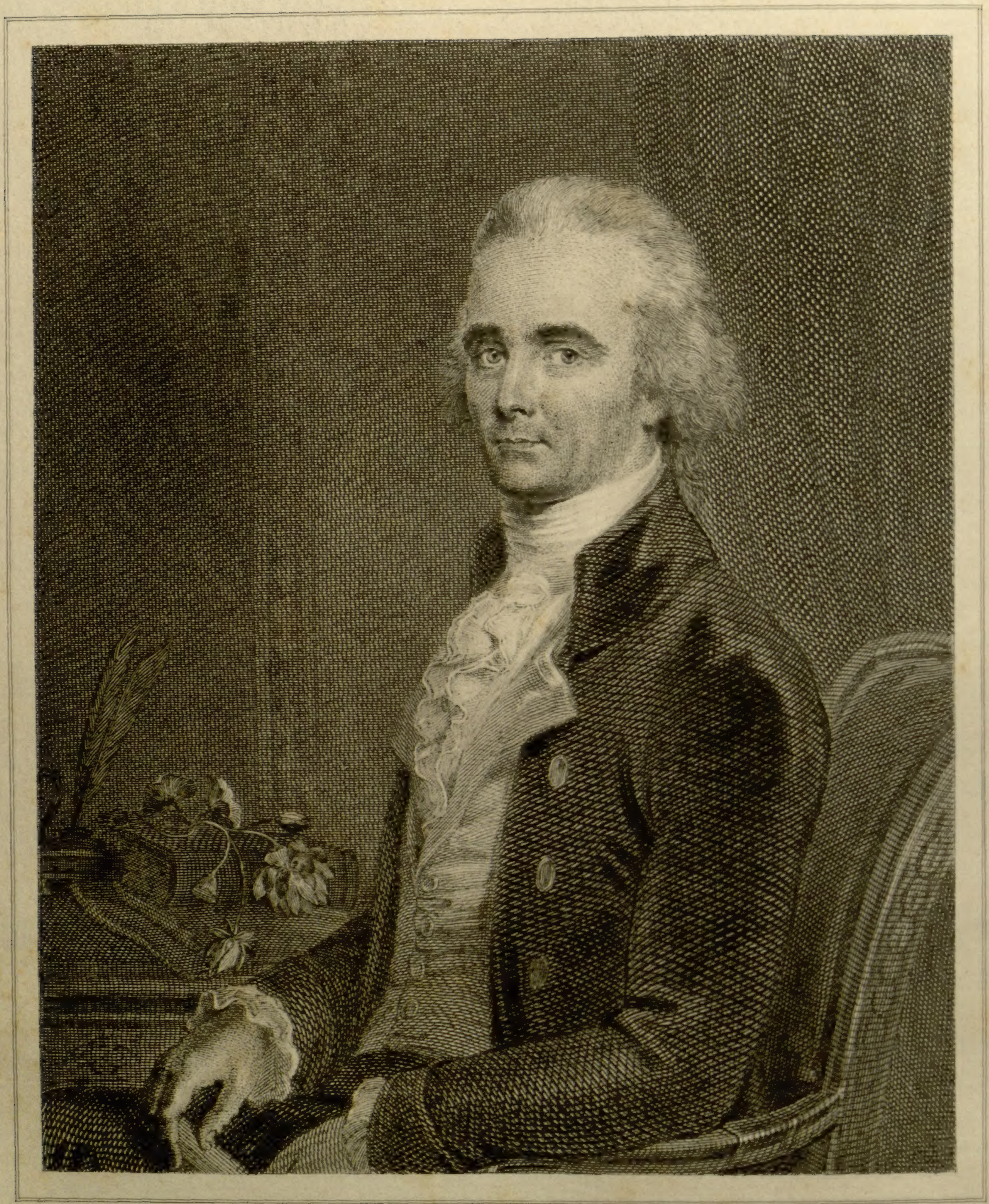

Photoetching.

Survey of India Offices, Calcutta, February 1895.

W^M. ROXBURGH.

SUPERINTENDENT OF THE BOTANIC GARDEN CALCUTTA 1793 TO 1813.

Enlarged from an Engraving by C. Warren.

ANNALS

OF THE

ROYAL BOTANIC GARDEN, CALCUTTA.

Vol. V.

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ANNALS

OF THE

ROYAL BOTANIC GARDEN, CALCUTTA.

Vol. V.

1. A CENTURY OF INDIAN ORCHIDS,

By SIR J. D. HOOKER, M.D., R.N., F.R.S., K.C.S.I., C.B., &c., &c.

2. A CENTURY OF NEW AND RARE INDIAN PLANTS,

By G. KING, M.B., LL.D., F.R.S., C.I.E., AND P. BRÜHL.

TO WHICH IS PREFIXED

A BRIEF MEMOIR OF WILLIAM ROXBURGH,

By Dr. G. KING.

CALCUTTA:
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E. A. Arnold, 37, Bedford Street, Strand.
1895.

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GARDEN LIBRARY

TO THE MEMORY

OF

William Roxburgh,

M.D., F.R.S.E., F.L.S.,

A MEMBER OF THE HONOURABLE EAST INDIA COMPANY'S

MADRAS ESTABLISHMENT;

SUPERINTENDENT OF THE BOTANIC GARDEN, CALCUTTA,

FROM 1793 TO 1814;

AUTHOR OF

THE PLANTS OF COROMANDEL,

THE HORTUS BENGALENSIS,

AND

THE FLORA INDICA.

THIS VOLUME IS DEDICATED

BY

THE PRESENT SUPERINTENDENT.

ROYAL BOTANIC GARDEN, CALCUTTA,
July 1895.

PREFACE.

The present volume of the Annals of the Royal Botanic Garden, Calcutta, consists of two parts. The first part contains descriptions of one hundred and one species of Indian Orchids by Sir J. D. Hooker, late Director of the Royal Garden, Kew, who generously agreed to their publication here. The second consists of descriptions of critical Indian species of *Ranunculaceæ* by Mr. Paul Brühl, of the Bengal Educational Service, and of an account by myself of eighty-three species of new and little-known Indo-Malayan plants—mostly Thalamifloral. A figure is given of each species described in both parts.

G. KING.

ANNALS

OF THE

ROYAL BOTANIC GARDEN, CALCUTTA.

Vol. V.

PART II.

A CENTURY OF NEW AND RARE INDIAN PLANTS.

By

P. BRÜHL, Bengal Educational Service,

and

G. KING, F.R.S., C.I.E.,

Superintendent of the Royal Botanic Garden, Calcutta.

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1896.

NOTE.

The present part of the Annals of the Calcutta Garden is the work of three authors. The descriptions of new and critical species of Ranunculaceæ, which occupy pages 71 to 114, together with the accompanying plates, are the work of Mr. P. Brühl, of the Bengal Educational Service. For the remaining portion of the volume, except the description and figure of *Milula spicata* (which were contributed by Dr. D. Prain, Curator of the Herbarium of this Garden) I am responsible.

G. KING.

Royal Botanic Garden,
Calcutta,
March 1896.

A BRIEF MEMOIR OF WILLIAM ROXBURGH,

AUTHOR OF

THE FLORA INDICA.

Prefixed to the last volume of these Annals, I gave a short account of Colonel Robert Kyd, the Founder and first Superintendent of the Calcutta Botanic Garden. It seems fitting therefore that some account should, in the present volume, be given of the Botanist to whom this Garden owes the establishment of its reputation as a centre of botanical work.

William Roxburgh was born at Underwood in the parish of Craigie in Aryshire on the 3rd June 1751.* His family, although not rich people, managed to give him the kind of liberal education which during the two centuries that preceded the introduction of school-boards, "standards" and capitation grants, used to be obtainable at almost every parochial school in Scotland. From the parish school Roxburgh went to the University of Edinburgh and, having attended as many of the medical classes there as were then required for a license to practice as a Surgeon's mate, he received (through the influence of Dr. Hope, then Professor of Botany at Edinburgh) an appointment in that capacity on one of the Honourable East India Company's ships. He accomplished several voyages to India on East Indiamen, and having, during the intervals spent at home, completed his medical studies at the University of Edinburgh, Roxburgh was offered, and accepted, an appointment on the same Company's Madras Establishment. Roxburgh arrived at Madras during 1776, and he there made the acquaintance of Dr. Koenig,† who happened at the time to be making one of his frequent visits to Madras. Koenig had come out to India about eight years previously, and had been working at Natural History (chiefly on its botanical side) ever since. Koenig had been a pupil of Linnæus, and was still an active correspondent of that great master. Coming originally to India at the instance of the King of Denmark, Dr. Koenig was attached to the Danish Settlement at Tranquebar. The inadequate income which he received there, however, induced him to accept service under the Nawab of Arcot, and it was while in the Nawab's service that he first met Roxburgh. From the special interest taken in him by Dr. Hope, there is every probability that Roxburgh had, as a student at Edinburgh, shown enthusiasm for Botanical Science. Koenig had already given practical proof of his

* In Chambers' Biographies of Eminent Scotchmen, the date is given as 29th June 1759, but that does not agree with Roxburgh's age at death as given on his tombstone.

† John Gerard Koenig, a native of Courland, pupil and correspondent of Linnæus, travelled in Iceland during 1765; went to the Danish Settlement in the Carnatic as Physician and Naturalist in 1768; entered the service of the Nawab of Arcot about 1774; was employed by the Madras Board in 1778, and entered the service of the Honourable East India Company in 1780; died of dysentery at Jagrenathporum on 26th June 1785.

devotion to it; and there can be little doubt that the daily intercourse of two such men in an unfamiliar country, where every plant was comparatively new to them, must have afforded the greatest mutual satisfaction, as well as the strongest mutual stimulus to work. The researches of the two friends into the botanical sources of the indigenous economic products of the Carnatic impressed the Madras Government so favourably that, from 1778, the Madras Board made a monthly allowance to Dr. Koenig to enable him to extend his enquiries to Siam and the Straits of Malacca, and in 1780 he was formally admitted into the Company's service. Koenig died of dysentery on the 26th of June 1785; he was attended during his last illness by Roxburgh, who makes a touching allusion to him in the following note appended to his description of *Roxburghia gloriosoides*, Dryand. (Fl. Ind. II, 236). "This," writes Roxburgh, "was one of the last plants Dr. Koenig saw. It was brought in when he was on his death-bed. He did attempt to examine it, but was unable; for the cold hand of death hung over him. He desired that I would describe it particularly, for he thought it was new, and uncommonly curious and beautiful. This observation from a worthy friend, a preceptor, and predecessor has made me more than usually minute in describing and drawing it." Koenig was immediately succeeded in his appointment as Government Botanist by Dr. P. Russel, who, however, held the office for but a short time, and he in turn was succeeded by Dr. Roxburgh. Roxburgh, who was presumably attached to a regiment (I can, however, find no definite information on the point) was moved about from place to place; but, from his first arrival in the Madras Presidency until his transfer to the Calcutta Botanic Garden in 1793, his service was confined to the Northern Circars, and a great deal of it was at Samulcotta,* a small station about seven miles from the town of Coconada, and about twenty-two from one of the mouths of the Godavery river.

Samulcotta stands on the edge of a hilly region possessing a very interesting *Flora.* For years it had been the practice, both of Koenig and of Roxburgh, to describe and make drawings of every plant they met. During his life-time Koenig had transmitted many specimens of plants to Europe, some of which had been published in the *Supplementum Systematis Plantarum* of the younger Linnæus and in Retz's *Observationes Botanicæ;* while others had been described by Schrader and by Vahl. Papers written by Koenig himself had also been published in the Transactions of the learned Societies of Berlin, Copenhagen, and Lund; and one in the first volume of the Transactions of the Linnæan Society of London. By Koenig's will, all his letters, papers, and unpublished manuscripts, as well as his dried specimens of plants, were bequeathed to Sir Joseph Banks, President of the Royal Society of London. Up to the time of Koenig's death Roxburgh had, so far as can be learnt, sent no plants to Europe, and had himself published nothing. Between the years 1791 and 1794, however, he transmitted, to the Court of Directors in London, descriptions and figures of no fewer than five hundred species. The Court placed these in the hands of Sir Joseph Banks, who selected three hundred of them which were published, at the Company's expense, in three large folio volumes under the title *The Plants of the Coast of Coromandel.* This was Roxburgh's earliest book; the first part of it appeared in 1795, the last not until 1819. Contemporary with

* In the article on Roxburgh in Knight's *Cyclopædia of Biography,* it is stated that he was stationed at Samulcotta from 1781 until his transfer to Calcutta; and also that at Samulcotta he established a garden where he introduced the plants yielding coffee, cinnamon, nutmeg, arnotto, and sappan wood as well as the bread-fruit tree, the mulberry tree, and various kinds of pepper vines. He is also said to have interested himself in the improvement of the cultivation of sugar, in the rearing of silkworms and in the manufacture of silk.

Roxburgh in India there were, in the end of the last and the early part of the present century, many keen Botanists, chief among whom may be mentioned Anderson, Berry, Campbell, Carey, Colebrooke, Fleming, Hardwicke, Kyd, Heyne, Hunter, Buchanan-Hamilton, John, Sir W. Jones, Klein, Leschenault, Rottler, Russell, Shuter, and Sonnerat. All these men probably received some stimulus from the ardour of Koenig, who appears to have been in India a sort of *avatar* of Linnæus. The majority of them contented themselves, however, with collecting and distributing unnamed specimens of Indian plants. Many of their plants sent to Europe were published by Linnæus filius, Lamarck, Roth, Retz, Smith, Vahl, A. P. De Candolle and others; while not a few were published in India by Roxburgh himself. Rottler did indeed issue some species bearing manuscript names, some of which have been kept up. But Roxburgh was the only one of the group who attempted to give an account of any considerable number of Indian plants in the form of a *Flora*, and for this reason he has been called the "Father of Indian Botany" and "the Linnæus of India."

Colonel Robert Kyd, the Founder and first Superintendent of the Botanic Garden at Calcutta, having died in May 1793, Roxburgh was appointed to succeed him, and he took charge of the Calcutta Garden on 29th November of the same year. Colonel Kyd had never lived in the garden; in fact there was no house fit for occupation by a European within its precincts. Roxburgh, however, determined to live in it, and one of the first matters which occupied his attention was the building of a house for himself. The spot selected by Roxburgh for his house (the present Superintendent's quarters) was on a bold promontory where the river Hooghly makes a bend. This site is marked in the old charts and maps as "thanna," and had at one time been occupied by a old fort. On the left bank of the Hooghly, just opposite this promontory and on the site of the village still known as Mattiabruj (mud-bastion), there stood in former days a similar fort; and the two formed a protection against enemies and pirates coming up the river. Roxburgh does not appear to have been so expert at building as he was at Botany. For the cost of the house erected by him exceeded the sum allotted by the Honourable Company by a considerable sum, and the Accountant-General of the period, with the obduracy hereditary to his office, refused to pay the excess.

Roxburgh appears to have arrived at Calcutta with a constitution impaired by hard botanical work in the feverish jungles of the Carnatic; for, within four years of his transfer to the Botanic Garden (*i.e.*, in 1797), he was obliged to make a voyage home for the re-establishment of his health.* In October 1799 he returned to Calcutta. But so soon as 1805 he had again to visit England on account of illness, and during this second visit he lived at Chelsea. He returned to Calcutta for the last time apparently about 1808; but during the hot season of 1813 his health completely broke down, and he was compelled to undertake a sea-voyage, which he at first intended should have been only to the Cape of Good Hope. His health, however, did not improve sufficiently at the Cape to warrant his return to Calcutta, and he therefore extended his voyage to St. Helena, and finally to England. Shortly after his arrival at home, he proceeded to Edinburgh, where he died at Park Place on the 18th February 1815. He was buried in the Greyfriars Churchyard there in the tomb of the Boswells of Auchinleck,

* According to one account, it was during this visit to Scotland that Roxburgh proceeded to the degree of Doctor of Medicine at the University of Edinburgh.

his third wife having been a daughter of that house. The part of the inscription on the tombstone which refers to Roxburgh is as follows:—

> Here are deposited the remains of Doctor William Roxburgh, of the Honourable East India Company's Civil Service, who died at Edinburgh on the 18th February 1815, aged 64. Also those of Mary, his wife, daughter of the late Robert Boswell, Esquire, W.S., who died in London on the 18th January 1859 in her 85th year. Beneath this stone are also deposited the remains of Mary, the eldest daughter of Doctor William Roxburgh, and the wife of Henry Stone, Esquire, who departed this life on the 30th January 1814, in the 30th year of his age.

Dr. Roxburgh was three times married. Through the kindness of Mr. N. Bonham-Carter, of the Bengal Civil Service, who is a lineal descendant of the Mrs. Stone mentioned on the tombstone, I am enabled to give the under-noted family table which, however, is unfortunately for the most part without dates:—

Marriages and Families of Dr. W. Roxburgh.

Miss Bonté.	*Miss Huttenmann.*	*Miss Boswell*
(Swiss or French; father perhaps Governor of Penang. She was one of three sisters. The other two married Mr. Amos and Baron Von Streng.)	(German.)	(of the Auchinlech family).
Child.	*Children.*	*Children.*
The above-named Miss Bonté had one child, Mary, who married Henry Stone, B.C.S., and had four children— 1. Richard (?), who died aged about six. 2. Mary (Lady Marjoribanks). 3. Amelia (Mrs. James MacArthur). 4. Sibella (Mrs. G. W. Norman).	1. George, killed by lightning in Java. 2. Anne, married Robert M. Tulloh, B.C.S. 3. Robert, Indian Army. 4. Bruce, ditto. 5. Elizabeth, married F. Curwen-Smith, B.C.S., and died 1891, aged 92. 6. Sophia, married John W. 7. James, Indian Army, married Miss Carnegie. 8. Henry (Royal Navy).	1. Sibella. 2. Mary Anne, married H. C. Tucker, B.C.S. *3. William, married Miss A. E. Boswell. (*Miss Boswell, the third Mrs. Roxburgh, was sister of Mrs. Egerton of Gresford.*)

Estimated by the amount of elaborated botanical materials which he left behind him, Roxburgh's life at the Calcutta Garden must have been one of continued hard work. When he quitted India for the last time in 1813, he left, under the charge of Dr. Carey, not only the manuscripts of his *Hortus Bengalensis* and of his *Flora Indica*, but also no fewer than 2,533 life-sized coloured drawings of Indian plants, with figures of excellent analyses of their flowers which had doubtless been made by himself. The majority of these drawings are of plants described in his *Flora*, so that, between his own descriptions and those figures, there is, in most cases, no room for

* There is apparently some error as to the order of the birth of the son named William; for, in a paper written in 1801 (and printed in the Transactions of the Society of Arts, Vol. XXII, page 313), William Roxburgh, junior, is credited with having discovered *Asclepias tenacissima* (*Marsdenia tenacissima, W. and A.*) in the jungles of the Rajmahal Hills.

any doubt as to what Roxburgh's species are. With the characteristic caution of his nationality, Roxburgh had several copies made of the manuscript of the *Flora Indica*. One of these he took home with him, intending to occupy the remainder of his life in amending and passing it through the press. Another copy he left with his friend, the Revd Dr. Carey, the celebrated Christian Missionary, who was himself an ardent Botanist, and who had brought together, in the Garden of the Mission House at Serampore, a collection of living plants second only to that under Roxburgh's charge at Sibpur. So competent a Botanist was Dr. Carey acknowledged to be, that he was put by the Local Government in charge of the Botanic Garden when Roxburgh was obliged to leave it; and he continued to hold charge of it until relieved by Dr. Buchanan-Hamilton, who was nominated its Superintendent by the Court of Directors in England. Dr. Roxburgh had not long left India before Dr. Carey passed the *Hortus Bengalensis* through the press, and thus secured for his absent and sick friend priority for many of his species. The *Hortus Bengalensis* consists of two parts, the first being a list of the plants growing in the Garden when Roxburgh left it, the second a catalogue of plants described by Dr. Roxburgh in his manuscript *Flora Indica*, but not yet introduced into the Botanic Garden. The former list contains about three thousand* five hundred species, of which no fewer than fifteen hundred and ten (including many new genera) had been first described and named by himself; the second list contains four hundred and fifty-three species, mostly Roxburghian. As has already been stated, Roxburgh took a copy of his manuscript *Flora Indica* home to Scotland with him, with the intention, in the light of the most recent views of systematic Botanists in Europe, of improving and amending it prior to publication; and (as he wrote to Dr. Carey) he hoped to have secured the assistance of Robert Brown in this matter. His ill-health, and death so soon after his return home, prevented, however, his doing anything towards this object; and the *Flora* remained in manuscript and untouched for six years. In the year 1820, however, Doctors Carey and Wallich undertook its publication. Dr. Wallich, then Surgeon to the Danish Settlement at Serampore and a young Botanist of much promise, had been appointed Superintendent of the Calcutta Garden at the end of Dr. Buchanan-Hamilton's short tenure of office; and he had employed the early years of his Superintendentship in making extensive collections in Nepal, and subsequently in the Straits of Malacca and in other parts of India which had never come within the scope of Roxburgh's efforts. It was decided that descriptions of these collections of Wallich should be incorporated with Roxburgh's manuscript, and that the whole should be published under the joint supervision of Carey and Wallich. The first volume of this work, covering the Roxburghian manuscript to the end of *Tetrandria*, appeared in 1820, and that volume contained but few of Wallich's interpolations. The second volume, which did not appear until four years later, contained, however, a great many of them, and it did not quite finish the *Pentandria* of the Roxburghian manuscripts. In fact, the decision to include Wallich's novelties was the cause of the failure of the whole project. For Wallich's capacities for collecting were so far in excess of his leisure for description and classification that he had to abandon the idea of carrying on his share of the work. The publication of the Carey and Wallich edition of Roxburgh's *Flora* therefore ended prematurely with the second volume. Eight years having elapsed without anything having been done towards the completion of its publication, its author's two sons, Captains Bruce and James Roxburgh, neither of whom

* Of this number, three hundred were growing in the garden when Roxburgh assumed charge of it.

was a Botanist, determined to print, at their own expense, their father's manuscript exactly as he had left it. This was done under the editorship of the venerable Carey, and the book was published, in three octavo volumes, at Serampore in 1832. This edition having been for many years out of print and difficult of purchase, a verbatim reprint of it, in a single volume (paged, however, according to the original), was undertaken in Calcutta in 1874, at the expense of Mr. C. B. Clarke, F.R.S., the present distinguished President of the Linnæan Society. Mr. Clarke's reprint also includes Roxburgh's account of Indian *Cryptogamia*, which was not included in Carey's Serampore edition, but which (having been rescued from oblivion by Griffith) was published by him in 1844, in the fourth volume of the Calcutta Journal of Natural History. Mr. Clarke's objects in re-publishing Roxburgh's *Flora* are stated at length in his excellent preface to his edition of it. The main one was to put the book within the reach of the poorest Indian student, and that object was most effectually fulfilled by his issuing the volume at a price (five rupees) which could not have covered one-half of the cost of publication, even had every copy of the edition been sold within a year. Roxburgh's *Flora* is still a most useful book to persons, who, without being really Botanists, desire to make themselves acquainted with the plants of the plains and of the lower slopes of the hills of Northern India and of the Madras Presidency. It contains also an account of the majority of the exotic plants which are cultivated, even at the present day, in gardens in the plains of India, and also descriptions of some plants which Roxburgh had introduced from various parts of the Malayan Peninsula and Archipelago (which he named in a general way "The Moluccas"). The descriptions of these "Molucca" plants are often meagre in the extreme, and are now practically of no value. Many of the common garden plants also are described in an imperfect way. And of the plants of the Himalaya and of the higher ranges of Southern India above levels of 500 feet or thereby, the *Flora* gives no account whatever. With reference to the imperfections of Roxburgh's *Flora* as a guide to the Botany of the Indian mountain ranges, it should, however, be borne in mind that the bulk of the indigenous population lives in the plains; and that it is only a small percentage even of the European population who actually reside in the hills.

The excellence of Roxburgh's *Flora* as a botanical work has so long been acknowledged that it is unnecessary here to enter upon any estimate of it. I would simply remark that Roxburgh's descriptions of Indian plants are, for the most part, so accurate and graphic that, while identifying a plant by his *Flora*, one can feel quite certain when he has got the very species that its author meant: one does not finish one's attempt with a headache and with the uneasy feeling that his plant may be one of half a dozen. I regard Roxburgh's accuracy as something marvellous. When an organ is not too minute for proper observation by means of the comparatively rude lenses obtainable in Roxburgh's time, one may trust to his account of it being absolutely correct. Authors since Roxburgh—and especially young authors—working chiefly with Herbarium specimens have, as it seems to me, reduced some of his species with rather too much levity. I have worked a good deal with Roxburgh's *Flora* and among Indian plants, and it takes a good deal to convince me of a Roxburghian blunder! Roxburgh's ideas of affinity are in the highest degree sagacious; and, had he lived a few decades later, his *Flora* would have doubtless been as successfully fashioned on the natural system as it was on the Linnæan. Finally, I would claim for Roxburgh's book the merit that it does not contain a single ill-natured or unkind remark. Never once does its author

insinuate that some other botanist is either an egregious blunderer, a vile filcher of another man's species, or a person of supreme incompetence.

As regards economic botany, Roxburgh's *Flora* is a perfect mine of wealth; and it is only since the publication of Dr. Watt's Economic Dictionary that it has been superseded as the standard book on Indian vegetable economics. Much of Roxburgh's time and a great deal of his attention were given to enquiries into indigenous vegetable products; and so greatly were his researches into the sources of fibres* and other useful substances esteemed in England, that on no fewer than three occasions were gold medals awarded to him by the Society of Arts. To him also much credit was due for the organization of the arrangements successfully carried out by one of his sons, for the introduction into the Honourable Company's Malayan possessions of the cultivation of the trees yielding cloves, cinnamon and nutmeg.

Roxburgh was not, as has been stated in some notices of him, one of the founders of the Asiatic Society of Bengal. As a fact he was stationed at Samulcotta when it was founded (1784); but after his settlement in Calcutta he took an active interest in its management and contributed several papers to its *Researches*.† Besides being a member of the Asiatic Society, Roxburgh was a Fellow of the Linnæan Society of London, of the Society of Arts, and of the Royal Society of Edinburgh. He was not, however, a Fellow of the Royal Society of London.

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* In Vol. XXII of the Transactions of the Society of Arts (London, 1804), there are printed many letters of Roxburgh's giving an account of his experiments into the mode of cultivation and properties of the fibres of hemp, jute, bowstring flax, sun, agave, Abiscus, &c.

† A list of all Roxburgh's contributions to Scientific Journals (taken from the Royal Society's Catalogue of papers) is given below:—

Roxburgh, *William*. On the Lacsha or Lac-Insect (*Coccus lacca*). Asiatic Researches, II., 1790, pp. 361—364; Tilloch, Phil. Mag. III, 1799, pp. 367—369.

2. A description of the plant *Butea*. Asiatic Researches, III, 1792, pp. 469—474.

3. A description of the *Jonesia*. Asiatic Researches, IV, 1795, pp. 355—358.

4. *Prunus ... , Kœnig*. Tshamie of the Hindus in the Northern Circars. Asiatic Researches, IV, 1795, pp. 405—408.

5. Botanical observations on the Spikenard of the ancients. Asiatic Researches, IV, 1795, pp. 433—436.

6. A botanical description of *Urceola elastica*, or Caoutchouc Vine of Sumatra and Pulo Penang, with an account of the properties of its inspissated juice compared with those of the American Caoutchouc. Asiatic Researches, V., 1798, pp. 167—177; Nicholson, Journ. III, 1800, pp. 435—440; Tilloch, Phil. Mag. VI, 1800, pp. 154—161.

7. An account of a new species of *Delphinus*, an inhabitant of the Ganges. Asiatic Researches, VII, 1801, pp. 170—174.

8. Account of the Tusseh and Arrindy Silk-worms of Bengal. [1802] Linn. Soc. Trans. VII, 1804, pp. 33—48.

9. A botanical and economical account of *Bassia butyracea* or East India Butter Tree. Asiatic Researches, VIII, 1805, pp. 477—488; Nicholson, Journ. XIX, 1808, pp. 372—379; Gilbert, Annal. XL, 1812, pp. 234—240.

10. On the culture, properties, and comparative strength of Hemp and other vegetable fibres, the growth of the East Indies. Nicholson, Journ. XI, 1805, pp. 32—47; Gill. Tech. Rep. VI, 1824, pp. 184—194, 240—244.

11. An account of the Hindu method of cultivating the Sugarcane and manufacturing the sugar and jagary in the Rajamundry district. Tilloch, Phil. Mag. XXI, 1805, pp. 264—275.

12. A table of the growth of trees in the Botanic Garden at Calcutta. Nicholson, Journ. XVII, 1807, pp. 110—11.

13. Description of several of the monandrous plants of India, belonging to the natural order called *Scitamineæ* by Linnæus, *Cannæ* by Jussieu and *Drimyrhizæ* by Ventenat. Asiatic Researches, XI, 1810, pp. 318—362; Sprengel, Jahrb. I, 1820, pp. 64—110.

14. Letter on various natural productions of the East Indies. Nicholson, Journ. XXVII, 1810, pp. 69—76.

15. Remarks on the Land Winds and their causes. London, Med. Soc. Trans. I, 1810, pp. 189—211; Tilloch, Phil. Mag. XXXVI, 1810, pp. 243—253.

16. Some account of the Teak tree of the East Indies. Nicholson, Journ. XXXIII, 1812, pp. 348—354.

17. *Flora Indica, Part 4*, Cryptogamous Plants. Calcutta, Journ. Nat. Hist. IV, 1844, pp. 463—520.

18. On the genus *Aquilaria*, with remarks by the late H. T. Colebrooke. [1851] Linn. Soc. Trans. XXI, 1855, pp. 199—206; Linn. Soc. Proc. II, 1855, pp. 123—125.

There can be little doubt that Roxburgh must have made large collections of plants during his long Indian career of thirty-eight years. Comparatively few of these can, however, now be traced in collections. It is known that his earlier collections in the Carnatic were destroyed by an inundation. He, however, made later collections in that province prior to his removal to Calcutta; and, during the twenty years of his life in the Calcutta Garden, when collecting was more or less his business, such an ardent botanist must have accumulated large quantities of dried plants. No Indian plants of his, however, now exist in the Calcutta Herbarium.* It is indeed asserted by Griffith, in his report on the Calcutta Garden written while he acted for Dr. Wallich in 1834, that the latter had carried off all Roxburgh's collections from Calcutta, and that they had (without being distinguished by any identifying mark) formed part of the great Herbarium of Indian plants distributed to the chief scientific institutions in Europe, at the expense of the East India Company, under Dr. Wallich's direction. A few of Roxburgh's Indian plants are to be found in the Edinburgh Herbarium; there are a few also at Kew and the British Museum, and doubtless there are others in some of the great Herbaria on the Continent of Europe; but the mass of them cannot be now traced. The want of complete suites of Roxburgh's plants is, however, greatly compensated for by the drawings which he left in Calcutta of the majority of the species named by him. Copies of all of these drawings were made at the expense of the late Sir W. J. Hooker, and were deposited by him at Kew where they can be now consulted; while many of them were printed on a reduced scale in Wight's *Icones Plantarum Indiæ Orientalis.*

A few years after Roxburgh's death some of his friends erected a monument to his memory on a little mound near the great banyan tree. The inscription on this monument, which was composed by Bishop Heber, is as follows:—

Quisquis ades

Si locus suavitate mentem permulcet
Aut admonet ut pie sentias de Deo
Habendus in honore tibi

Roxburghius

Horum hortorum olim præfectus
Vir scientiæ botanices laude florens
Idemque amœnitatum agrestium

Summus artifex

Conservat cinerem Patria
Hic viget ingenium
Tu fave et perfruere
B. M. P. C. Superstites Amici A. D. 1822.

The portrait which forms the frontispiece to the present volume is a reproduction (by the process of photographic etching by my friend Colonel James Waterhouse) of the picture published in thirty-third volume of the Transactions of the Society of Arts (London, 1815).

* A number of plants, collected at the Cape of Good Hope during his last voyage to England, were presented to the Herbarium about twenty years ago by a surviving daughter.

In preparing this brief memoir, I have received much kind help from my friend Mr. Henry Beveridge, late of the Bengal Civil Service. Mr. Beveridge had the records of the parish of Craigie, as well as the Register House in Edinburgh, searched (unfortunately in vain) for the entry of Roxburgh's birth; and it was he who kindly copied for me the inscription on the tombstone in Greyfriars Churchyard.

BOTANIC GARDEN, CALCUTTA,
June 1893.

G. KING.

E. J. H.—Reg. No. 2868Je of 1893 94—300 - 11-11 93.

A

CENTURY OF INDIAN ORCHIDS

SELECTED FROM

DRAWINGS IN THE HERBARIUM OF THE BOTANIC GARDEN, CALCUTTA,

By

J. D. HOOKER, M.D., R.N., F.R.S., K.C.S.I., C.B., &c., &c.

WITH ONE HUNDRED AND ONE PLATES.

CALCUTTA:
Printed at the Bengal Secretariat Press.

LONDON:
Sold by B. Quaritch, 15, Piccadilly; Keegan Paul, Trench, Trübner & Co., Ld.;
A. Constable & Co., 14, Parliament Street; Luzac & Co., 46, Great Russell Street;
E. A. Arnold, 37, Bedford Street, Strand.

1895.

A

CENTURY OF NEW AND RARE INDIAN PLANTS.

By

P. BRÜHL, Bengal Educational Service,

and

GEORGE KING, M.B., F.R.S., C.I.E.,

Superintendent of the Royal Botanic Garden, Calcutta.

WITH NINETY-NINE PLATES.

CALCUTTA:

Printed at the Bengal Secretariat Press.

LONDON:

Sold by B. Quaritch, 15, Piccadilly; Keegan Paul, Trench, Trübner & Co. Ld.; A. Constable & Co., 14, Parliament Street; Luzac & Co., 46, Great Russell Street; E. A. Arnold, 37, Bedford Street, Strand.

1896.

A

CENTURY OF INDIAN ORCHIDS,

SELECTED FROM THE

DRAWINGS OF PLANTS IN THE HERBARIUM OF THE ROYAL BOTANIC GARDEN, CALCUTTA,

WITH DESCRIPTIONS, &c.

BY

J. D. HOOKER, M.D., R.N., F.R.S., K.C.S.I., C.B., &c., &c.

THE drawings here reproduced in lithography consist of a small selection from the magnificent series of Indian plant-portraits by native artists, that have been accumulating in the Calcutta Botanic Garden for nearly a century. The collection was commenced by Dr. Roxburgh, then Superintendent of the garden, before the end of the last century, and has been steadily added to by his successors, Drs. Wallich, Falconer, Thomson, Anderson, Clarke and King down to the present day, when it numbers from six to seven thousand drawings. Of these the most important botanically and most instructive scientifically are those of the orchids, of which there are about one thousand.

It was not until I had almost completed the descriptions of the Indian orchids for the "Flora of British India" that I ventured to ask Dr. King whether permission could be obtained from the Bengal Government for the transmission and temporary deposit in the Royal Gardens, Kew, of the drawings of this Order, so as to enable me to make such use of them as was still possible for my Flora. My request met with a prompt and generous acquiescence from Dr. King, who lost no time in obtaining the requisite permission and in forwarding the drawings to Kew.

As stated in the remarks preliminary to the "Supplement to the Orchideæ" contained in vol. v, p. 176 of my Flora, the inspection of these drawings, together with the study of a multitude of specimens received through Dr. King from the Calcutta Herbarium, some on loan and some as gifts to Kew, necessitated a revision of the characters of the greater proportion of the species already described (often from very imperfect materials), and consequently entailed many emendations in the latter, together with the addition of not a few new species.

The great assistance afforded me by the drawings, and their manifest superiority to descriptions, however exact and complete, for the identification of plants belonging to this most difficult Order, suggested the desirability of having a selection of them published for the use of scientific botanists and cultivators of orchids. To this end I offered, should my suggestion meet with Dr. King's approval, my services in selecting a century of them for publication in the "Annals of the Calcutta Garden," adding fuller (and often amended) descriptions and observations on the species figured than could be given in the limited space devoted to the orchids in "The Flora of British India." Dr. King's cordial approval gratified me much, and this Part of the Annals is the result.

I should call attention to the fact that, excellent as the drawings are in many respects, as representatives of the plants pourtrayed, they err in manifesting that tendency to enlarge, which is a besetting sin of Indian botanical artists; and that the analyses leave much to be desired in the matter of proportion and accuracy. Of these defects the first is irremediable; the others I have in many instances endeavoured to certify or to check, by adding analyses of my own. In no case do these defects appear to me to detract materially from the value of the illustrations as a means of identifying the plants represented.

It remains to add that the drawings here reproduced were the work of many native artists of various skill and attainments, subsequent to the series commenced by Dr. Roxburgh; that they date from the period of Dr. Wallich's superintendency of the Royal Gardens; and that the artists' name being rarely recorded, the inscription at the left hand lower corner of each plate should read "Lithographed by" and that on the corresponding right hand corner "Printed by." Exact copies of the whole Calcutta collection of drawings of Indian orchids have been, with Dr. King's permission, made under my supervision for Kew, and are deposited in the Herbarium of that establishment, the cost having been defrayed by the Trustees of the Bentham Fund.

J. D. HOOKER.

Camp, Sunningdale, October 1892.

A CENTURY OF INDIAN ORCHIDS

BY

Sir JOSEPH DALTON HOOKER.

PLATE 1.

Oberonia orbicularis, *Hook. f.*

O. orbicularis; foliis ensiformibus sensim acuminatis, scapo crasso foliaceo vel folio confluente, spica elongata cylindracea sensim longe attenuata densiflora, floribus subsessilibus rachi crassa quasi applanatis aurantiacis, ovario brevissimo, bracteis late ovatis orbiculatisve erosis, sepalis petalisque ovatis obtusis integerrimis, labello orbiculato concavo sepalis majore integerrimo vel crenulato apicem versus obscure 3-lobo v. emarginato. *Hook. f. Fl. Brit. Ind.* v. 677.

Hab.—Sikkim-Himalaya; at Dikkeeling, alt. about 4,000 ft., *Clarke.* Khasia Hills, *Gibson.*

Stems very short, densely tufted, flat. *Leaves* 4—6 in. long by ½—⅔ in. broad towards the base, gradually narrowed from the base to the tip, dark green. *Spike* sessile on the top of a flat, truncate, leaf-like scape, or inserted at the margin or top of a leaf, being in fact wholly or in part confluent with a leaf, 4—6 in. long by ¼ in. diam., terete, very gradually narrowed from the base to the filiform tip. *Flowers* minute, pressed down on the broad membranous erose bracts, dull orange yellow, with the lip darker and deeper coloured.

Very closely allied to *O. pachyrachis*, Reichb. f. Mss. (Fl. Brit. Ind. v. 681), which has the same disposition of the leaves and spike, and minute sessile flowers crowded on the thick terete rachis, and nearly the same sepals and lip; but in that plant the bracts are shorter and broader and the petals are very narrow. As, however, both plants inhabit the Eastern Himalaya and Khasia Hills, they may prove forms of one species.

The drawing of *O. orbicularis* was made at the Calcutta Garden from specimens sent by Mr. Gibson, a collector for the Duke of Devonshire, from the Khasia Hills, to Dr. Wallich in 1836. It bears the manuscript name of *O. phyllostachys*, in Wallich's hand-writing, a significant name which I should have retained had I known of it when describing the genus *Oberonia* for the Flora of British India.

Fig. 1, portion of spike; 2, bract; 3, front and 4, back view of flower; 5, flower with perianth-segments displaced; 6, ovary, column and anther; 7, pollinia,—*all greatly enlarged.*

PLATE 2.

Microstylis Wallichii, *Lindl.*

M. Wallichii; foliis 2—4 sessilibus petiolatisve elliptico-vel ovato-lanceolatis acuminatis marginibus sæpius undulatis, scapo acute angulato, racemo multifloro, bracteis ovario brevioribus patentibus vel reflexis, labelli lamina apice rotundata v. emarginata, auriculis

acutis v. obtusis. *Lindley in Wall. Cat.* n. 1938 *et Gen. and Sp. Orchid.* 20; *Ridley in Journ. Linn. Soc.* xxiv. 337; *Hook. f. Fl. Brit. Ind.* v. 686. Malaxis acuminata, *Don Prodr. Fl. Nep.* 29 (fid. obs. in Herb. Wallich).

HAB.—TEMPERATE and SUBTROPICAL HIMALAYA, alt. 4—7,000 ft. from Simla to Sikkim. KHASIA HILLS, alt. 5—6,000 feet. ? Andaman Islands, *Kurz.* TRAVANCORE and the Anamallay Hills, *Beddome* (*fid. Ridley*). DISTRIB.—Cambodia.

Rhizome creeping, fleshy. *Stem* 2—3 in., sheathed. *Leaves* 3—5 in. long, many-nerved, bright green above, strongly ribbed, and often discoloured wholly or on the nerves only beneath. *Scape* 3–8 in. high, slender. *Raceme* 2–4 in. long, narrow; bracts ovate, acute, green; flowers $\frac{1}{4}$ in., nearly $\frac{1}{2}$ inch from the tip of the lip to that of the dorsal sepal, greenish, purplish or yellowish. *Sepals* oblong, dorsal 1–3-nerved, lateral 3–5-nerved. *Petals* 3-nerved. *Lip* very variable as to the comparative and absolute length and breadth of the lamina and auricles.

The plate represents a very small-flowered state of the species. *Microstylis Wallichii* is a very common and variable Himalayan and Khasian plant; and probably, as hitherto defined, includes more than one species. To illustrate the great differences in form of lip that occur in plants of *M. Wallichii* or closely allied species not hitherto distinguished from it, I have added to the plate enlarged figures of the following:—

A. Flower of a Khasian specimen, with sessile leaves cordate at the base; A1, dorsal, A2, lateral sepal; A3, petal,—*all spread out.*

B. Flower of another Khasian specimen with narrower, longer-petioled leaves; the lip nearly rounded at the apex; auricles long, parallel, acute.

C. Lip and dorsal sepal from the type of *M. Wallichii*, Lindl., in Herb. Kew (*Wall. Cat.* n. 1938-1). The sepals are very broad and the lip contracted opposite the column and 3-lobulate at the apex; the auricles divergent.

D. Flower from a large form cultivated at Kew, named *M. biloba*, Reichb. f. The leaves are 6—7 by 2–2$\frac{1}{4}$ in.; scape with raceme 12—14 in.; bracts $\frac{1}{8}$ in. long, reflexed; lip 2-lobulate at the apex; auricles parallel.

E. Flower of specimen from the Andaman Islands (*Kurz*) with the apex of the lip acute and auricles crossing. Leaves all broadly ovate, 3—4 by 2—2$\frac{1}{4}$ in. The lip appears not to be concave in front of the column. It is probably a distinct species.

F. Flower of var. *omphaloides* (M. obliqua, *Parish Mss.*) from Moulmein. Lip 2-lobulate at the apex; auricles short, rounded, overlapping. Mr. Parish observes of this, "very near indeed to *M. omphaloides*, but the flowers are fewer (8—10), somewhat longer, lip nearly a perfect oval, with the lobes overlapping and tip notched; the column 2-dentate (not 4-dentate as in *omphaloides*)." F1, front view of column with anther; F2, back view of column with anther removed; F3, anther—*all from a drawing by Mr. Parish.*

G. Flower of var. *brachycheila*, from Moulmein, labelled *M. biloba* by Parish; the leaves are petioled, lanceolate.

The drawing which is reproduced in Plate 2 was inscribed "Sikkim, 4,000 feet, July 14, 1874, G. King." The figures 1 and 2 at the left-hand upper corner and the analyses at the left-hand lower corner are those of the specimen represented; 1, front and 2, back view of flower; 3, lip; 4, dorsal sepal; 5 and 6, lateral sepals; 7 and 8, petals; 9, column—*all enlarged.*

PLATE 3.

LIPARIS (*Mollifoliæ*) GAMBLEI, *Hook. f.*

L. Gamblei; pseudobulbis subglobosis, folio solitario sessile vel petiolato ellipticovel oblongo plicato crenulato v. integerrimo, bracteis ovatis acutis, sepalis oblongo-lanceolatis

obtusis 3-nerviis lateralibus labello suppositis, petalis linearibus 1-nerviis, labello deflexo elliptico acuto crenulato lateribus deflexis basi minute 2-calloso, columna tenui incurva. *Hook. f. in Hook. Ic. Plant. t.* 1812 *et Fl. Brit. Ind.* v. 693.

HAB.—SIKKIM-HIMALAYA, at Rungbee, alt. about 5,000 feet, *Clarke*: on Sinchul, alt. 6,500 feet, *Gamble*.

Pseudobulbs clustered, the size of a small hazelnut, green, smooth. *Stem 0. Leaf* 4–6 in., obtuse, acute or suddenly narrowed into an obtuse tip, with about 12 plaits, pale green, narrowed at the base; petiole 0—2 in. *Scape* enfolded by the base of the leaf, rather stout, shorter than the leaf, many- and lax-flowered; rachis of raceme (in the drawing) rather thickened, reddish, ribbed; bracts erect, spreading, green; pedicel with ovary $\frac{1}{4}$ in., slender. *Sepals* $\frac{1}{4}$—$\frac{1}{3}$ in., pale pink, margins recurved. *Lip* rather longer than the sepals, greenish-yellow, with three strong, red median nerves, margins, and branching lateral nerves. *Column* strongly incurved above the middle, terminal wings entire or more or less notched.

In the specimens of this species described in the Flora of British India, the leaves were sessile, whereas in this they have rather long petioles.

Fig. 1, bract; 2, flower; 3, lip; 4, anther; 5, pollinia—all *enlarged* from the specimen figured, collected in "Sikkim, alt. 6,000 ft., Aug. 1876, G. King." Figs. A1, flower and A2, lip, are from Gamble's specimen, also *enlarged*.

PLATE 4.

LIPARIS (*Coriifoliæ*) PLANTAGINEA, *Lindl.*

L. plantaginea; pseudobulbis magnis ovato-oblongis compressis, foliis 2 sessilibus suboppositis lineari-oblongis oblanceolatisve acutis, scapo valido teretiusculo vel compresso, bracteis ovato-lanceolatis ovarium subæquantibus, sepalis obtusis 3-nerviis rectis lateribus revolutis, petalis linearibus 1-nerviis, labello sepalis æquelongo a basi deflexo orbiculare breviter unguiculato crenulato basi 2-tuberculato, columna incurva apice exalata. *Lindl. Gen. & Sp. Orchid.* 29; *Ridley in Journ. Linn. Soc.* xxii. 286; *Hook. f. Fl. Brit. Ind.* v. 702. L. selligera, *Reichb. f. in Linnæa* xli. 42. L. orbicularis, *Lodd. ex Hemsl. in Gard. Chron.* 1881, ii. 592. L. Griffithii, *ex parte Ridley l.c.* 285.

HAB.—SIKKIM-HIMALAYA, alt. 1—2,000 feet, *Clarke.* UPPER ASSAM, at the Brahmakoond, *Griffith.*

Pseudobulbs 2—3 in. long by 1—1½ in. broad, smooth, green, much compressed; sheaths membranous, acute. *Flowering scape* from the base of the old pseudobulb, 2—3 in. by $\frac{1}{2}$—1 in. broad, flattened, clothed with compressed green imbricating acute sheaths. *Leaves* 6—10 by 1—2 in., keeled, sessile or narrowed into a petiole, 5—7-nerved. *Scape* with the raceme about as long as the leaves, strict or flexuous; bracts $\frac{1}{3}$—$\frac{2}{3}$ in., concave; flowers 1 in. broad, green. *Lip* with 3 median nerves and branching lateral ones.

Lindley gives Bhutan as the habitat for this species, and in all probability it is a native of that country; but the specimen he described, and which is preserved in his Herbarium now at Kew, is ticketed from the Brahmakoond.

The drawing here reproduced is inscribed "Sikkim, 5-3-83, fld. in H. B. C., 19-7-83, G. King." The following figures are of the specimen drawn:—1, bract and bud; 2, side and 3, front view of flower; 5, lip,—*all of the natural size*; 4, flower with the lateral sepals and lip removed; 6, anther—*both enlarged*. The figures under A are from analyses of my own of a plant that flowered in the Royal Garden, Kew, in June 1866, and is the type of Reichenbach's *L. selligera*; A, lip; A1, dorsal and A2, lateral sepals; A3, petal; A4, column—*all enlarged.*

PLATE 5.

DENDROBIUM (*Bolbodium*) PUMILUM, *Roxb.*

D. pumilum; dense cœspitosum, pseudobulbis oblongis linearibusve cylindraceis demum tetragonis v. multisulcatis 1—2-foliatis, foliis parvis brevibus ellipticis v. rotundatis crasse coriaceis obtusis, floribus ad apicem pseudobulbi solitariis breviter pedicellatis, sepalis albis lateralibus late triangularibus acutis, dorsali multo minore ovato, petalis lineari-oblongis, mento corniforme sepalis longiore incurvo, labello oblongo v. obovato-oblongo apice 2-lobo lobis rotundatis crispatis, disco carina lata flava instructo. *Roxb. Hort. Beng.* 61 *et Fl. Ind.* iii. 479 *in part; Griff. Notul.* iii. 315; *Lindl. in Journ. Linn. Soc.* iii. 6; *Hook. f. Fl. Brit. Ind.* v. 713: vi. 184.

HAB.—CHITTAGONG, *Roxburgh.* PEGU, at Rangoon (*in Herb. Hort. Calcutt.*). TENASSERIM, *Griffith.* PERAK, *Scortechini.* SINGAPORE, *Ridley.* DISTRIB.—Borneo.

Pseudobulbs crowded, of one usually many-grooved node, 1—$1\frac{1}{2}$ in. long, sessile or sub-stipitate. *Leaves* $\frac{3}{4}$—1 in., sessile, chanelled along the centre above, strongly keeled beneath, dark green. *Flowers* 1 in. long, white or flushed with yellow; pedicel with ovary $\frac{1}{2}$—$\frac{3}{4}$ in. *Lateral sepals* 7-nerved. *Lip* with the median ridge obscurely caruncled, ending in a horse-shoe-shaped or notched caruncle in front of the terminal lobes.

The description of this given in Roxburgh's Flora is mixed up with that of an *Eria*, no doubt through an error of the transcriber or printer; his drawing of it is excellent. According to the plate here given, the pseudobulbs are sometimes tetraquetrous, which suggests the suspicion that *D. quadrangulare*, Parish (Fl. Brit. Ind. v. 714), may not be (as Parish supposed it was) really distinct. The flowers are identical in the two, but *D. quadrangulare* otherwise differs in the clavate pseudobulbs, linear-oblong leaves and fascicled flowers. Mr. Ridley, writing to me from Singapore, says that "*D. pumilum* is common at Singapore, with flowers yellow or cream-coloured; lip with a dark spot at the tip, or veined with red. I never saw many flowers in a head as in *D. quadrangulare*."

The drawing here reproduced is inscribed "Moolyet (a mountain in Tenasserim), *Gallatly*, July 1877, G. King." Fig. 1, flower with the sepals and petals detached and lip removed, and the foot of the column down to the notched base of the mentum coloured pink and yellow; 2, pedicel and column with its foot, the anther removed; 3, side view of the same; 4, lip, represented as much narrower than in the drawing of the plant and than in any specimen seen by me; 5, anther; 6, pollinia:—*all enlarged.*

PLATE 6.

DENDROBIUM (*Stachyobium*) DENUDANS, *Don.*

D. denudans; caulibus cœspitosis elongatis suberectis v. nutantibus, foliis distichis linearibus lineari-oblongisve acutis obtusis vel emarginatis caducis, racemis axillaribus elongatis gracillimis cernuis, bracteis minutis, sepalis petalisque lanceolatis attenuato-acuminatis falcatis, mento brevi incurvo obtuso vel rotundato, labello sepalis multo breviore, lobis lateralibus serrulatis incisisve, terminali parvo ovato recurvo vel revoluto crispato, disco 2-lamellato. *Don Prodr. Fl. Nep.* 34; *Wall. Cat. n.* 2014 *ex parte; Lindl. Gen. & Sp. Orchid.* 84 *et in Bot. Reg.* 1838 *Misc.* 156 *et* 1844 61 *et in Journ. Linn. Soc.* iii, 19; *Hook. f. Fl. Brit. Ind.* v. 715.

HAB.—TEMPERATE and SUBTROPICAL HIMALAYA, alt. 4—7,000 ft., from Kumaon eastward to Sikkim.

Stems 6—10 in. long, leafy throughout, or (through the early fall of the lower leaves) naked below, except for their sheaths. *Scapes* axillary, very slender, with the raceme 4—6 in., rachis flexuous; pedicel with ovary $\frac{1}{6}$—$\frac{1}{4}$ in. *Flowers* $\frac{2}{3}$ in. long, white or greenish with red mentum and red veins on the lip, or yellowish with a greenish lip. *Dorsal sepal* 3-nerved, lateral 5-nerved; petals 1-nerved, all drawn out into very slender points. *Column* very short. *Anther* with an erose margin.

The drawing reproduced here represents a greatly more robust state of the species than I have seen, and the side lobes of the lip are toothed only, not deeply cut, as in the specimens I have examined; which invalidates the subsectional character which I have given in the Flora of British India, where *D. denudans, criæflorum*, Griff., *alpestre*, Royle, and *strongylanthum*, Reichb. f., are distinguished from *D. microbulbon* and others by the deeper cutting of the lip.

The drawing here reproduced is inscribed "near Darjeeling, 1862, *T. Anders.*" Fig. 1, flower; 2, column; 3 & 4, anther; 5 & 6, pollinia:—*all enlarged.*

PLATE 7.

DENDROBIUM (*Stachyobium*) ERIÆFLORUM, *Griff.*

D. eriæflorum; caulibus brevibus pseudobulbosis, foliis linearibus vel lineari-oblongis vel lanceolatis acutis vel emarginatis, scapis gracilibus foliis longioribus nutantibus multifloris, bracteis parvis, sepalis lanceolatis acuminatis falcatis, mento breve incurvo obtuso vel rotundato, labello sepalis fere æquilongo, lobis lateralibus pectinatim v. subfimbriatim serratis, terminali undulato, disco medio cristato, columna apice grosse dentata. D. eriæflorum, *Griff. Notul.* iii. 316 *et Ic. Pl. Asiat.* t. 307; *Lindl. in Journ. Linn. Soc.* iii. 19; *Hook. f. Fl. Brit. Ind.* v. 715.

HAB.—SIKKIM-HIMALAYA; alt. 6,000 ft., *J. D. Hooker, &c.* KHASIA HILLS, alt. 4—5,000 ft., *Griffith, &c.*

Stem 6—8 in., basal or all the internodes thickened, the upper few leafing. *Leaves* 2—3 in., distichous. *Scape* with raceme 3—4 in.; pedicel with ovary $\frac{1}{4}$ in.; flowers green, $\frac{2}{3}$ in. long. *Sepals* and *petals* simply acuminate, not drawn out into long points; petals oblanceolate, acute. *Lip* green, with red veins. *Anther* not erose on the margin (as it is in *D. denudans*).

In the Flora of British India I have described the flowers from various sources as being as variable in colour as those of *D. denudans*, to which this species is closely allied. I had not, however, any knowledge of these being green as here represented, and I had not observed the toothing of the top of the column; or that the margin of the anther was erose in *D. denudans* and entire in *D. eriæflorum.* The stems also of this are longer and more slender in the specimens I have examined than in the figure here reproduced, which is inscribed "84, D. denudans, Don? Mr. J Gibson, 1836. G. Mann showed me a drawing of this plant collected halfway between Punkabari and Kurseong, 1867. T. Anders. D. eriæflorum, *Griff.*; see t. 307 Monocot. Pl. Notul. iii. 316, G. King."

Fig. 1, flower; 2, the same with perianth segments detached; 3, column; 4, anther; 5, pollinia:—*all enlarged.*

PLATE 8.

DENDROBIUM (*Stachyobium*) PARCUM, *Reichb. f.*

D. parcum; caulibus densissime cœspitosis gracilibus elongatis ramosis pendulis, racemis brevissimis axillaribus paucifloris, floribus parvis, sepalis viridibus lateralibus oblongis obtusis v. subacutis 3-nerviis, petalis lineari v. oblongo-spathulatis, mento late incurvo obtuso sepalis longiore, labello recto v. recurvo flavo basi rubro maculato, sepalis longiore anguste spathulato apice dilatato cuneiforme v. orbiculato truncato v. retuso. *Reichb. f. in Gard. Chron.* 1866, 1042 *et Xen. Orchid.* ii. t. 169.; *Hook. f. Fl. Brit. Ind. v.* 720.

HAB.—TENASSERIM; near Moulmein, *Parish.*

Stems 10—18 in., narrowed at the base, as thick as a goose-quill, green; internodes $\frac{3}{4}$—$1\frac{1}{2}$ in., terete, lowest sheathed; nodes discoloured; branches elongate, with short brown sheaths at the very slender base. *Leaves* not seen, probably occurring only in a very young state of the plant. *Peduncle* $\frac{1}{4}$—$\frac{1}{3}$ in., slender, with very short imbricating sheaths at the base, 2—4-fld.; pedicel with ovary $\frac{1}{2}$ in.; flowers $\frac{1}{3}$—$\frac{1}{2}$ in. long. *Sepals* subfalcate; petals 3-nerved, as long as the sepals, green; lip nearly twice as long as the sepals. *Anther* conical.

A singular species, leafless in all the specimens I have seen, as well as in the drawing, though probably leaves are to be found in the young state of the plant; and are, as in its near ally *D. herbaceum, Lindl.* of the Deccan peninsula, very caducous. The lip, which is described as cuneiform and straight, and which appears to be so in dried specimen, is here represented as deflexed beyond the middle.

The drawing here reproduced is inscribed "D. linguæforme Par. mss., Tenasserim Province, brought from Moulmein, 3rd February 1866. Drawn by Gopal, 15th February 1866. T. Anderson."

Fig. 1, flower with the perianth segments detached; 2 and 3, anther; 4, pollinia—*all enlarged.*

PLATE 9.

DENDROBIUM (*Formosæ*) WILLIAMSONI, *Day and Reichb. f.*

D. Williamsoni; caulibus robustis flexuosis, vaginis foliisque hirto-puberulis, foliis lineari-oblongis lanceolatisve obtusis v. 2-dentatis, floribus 1—2 terminalibus breviter pedunculatis amplis, sepalis albis lateralibus lanceolatis acuminatis, dorsali ovato acuto, mento infundibulari sepalo dorsali fere æquilongo, labello aureo basi rubro-maculato lobis lateralibus brevibus rotundatis, terminali orbiculari plicato ciliato, disco obscure tricarinato. *Day et Reichb. f. in Gard. Chron.* 1869, 78; *Hook. f. Fl. Brit. Ind.* v. 721.

HAB.—ASSAM, *Williamson.* KHASIA HILLS, *Gallatly.*

Stems tufted, narrowed at the base, stout and fusiform or elongate (8—10 in.) and flexuous; naked below; internodes $\frac{1}{2}$—$1\frac{1}{2}$ in., grooved. *Leaves* 2—4 in., pubescent on both surfaces, sessile, nearly flat, keeled, coriaceous. *Flowers* $1\frac{1}{2}$—2 in. long from the tip of the dorsal sepal to that of the mentum, yellowish without, white within except the yellow lip; peduncle $\frac{1}{4}$—$\frac{1}{2}$ in., sheathed 1—2-fld., hidden amongst the uppermost leaves. *Lateral sepals* subfalcate; petals obovate, acuminate. *Column* with a toothed 2-lobed tip. *Anther* with ciliate margins, 2-lobed.

Of this fine species I have seen no native specimens. It was first described in 1869 from a plant supposed to have been imported from Assam, which locality was at that period the putative birthplace of every orchid from N. E. India, the preciser habitats of which were not indicated. Nothing further was known of it until the publication of the Flora of British India, wherein the drawing here reproduced is mentioned, and on which is written "sent from the Khasia hills by Mr. Gallatly; fld. in Bot. Gardens, 30th January 1879. *G. King.*"

Fig. 1, flower; 2, the same with the perianth segments detached; 3, lip spread open; 4 and 5, anther; 6, pollinia:—all but fig. 1, *enlarged.*

PLATE 10.

DENDROBIUM (*Aporum*) LEONIS, *Reichb., f.*

D. Leonis; robustum, foliis crasse coriaceis late ovatis v. breviter cultriformibus obtusis, floribus terminalibus solitariis, bracteis numerosissimis fibrosis, sepalis lateralibus rotundatis, petalis oblanceolatis, mento rotundato, labello lineari-oblongo marginibus involutis apice rotundato v. retuso disco infra apicem carunculato. *Reichb. f. in Walp. Ann.* vi. 280; *Hook. f. Fl. Brit. Ind.* v. 723; vi. 184. Aporum indivisum, *Lindl. in Wall. Cat. No.* 2018 *et Gen. and Sp. Orchid* 70 (*non Blume*). A. Leonis, *Lindl. in Bot. Reg.* 1840 *Misc.* 59; *Griff. in Calc. Journ. Nat. Hist.* v. 368.

HAB.—SINGAPORE, *Prince.* MALACCA, *Griffith.* PERAK, *Scortechini. Wray.*—JAVA.

Stem branching from the base; branches prostrate, 6—10 in. by 1—1½ in. broad across the leaves, quite flat. *Leaves* ¾ in. long and broad, not striated, margins thickened when dried, dark lurid green. *Flowers* shortly and stoutly pedicelled, the pedicel about ¾ in. long and broad, sunk in the brush-like tuft of filiform bracts, dirty purplish and yellow green (pale citron tinged with claret, *Wray*); mentum forming a rounded base to the flower; lip recurved, rather longer than the lateral sepals. *Anther* 2-lobed on the crown.

Mr. Ridley, writing from Singapore, informs me that the flowers are exquisitely scented of vanilla. The specimen figured is inscribed "D. indivisum, *Blume.* Singapore 10 (1861). T. Anderson, Fld. 20-3-62." I have pointed out in the Flora of British India that Blume's *D. indivisum,* of which there is an authentically named specimen in Herb. Lindl. (now at Kew), has much longer not thickened leaves, and a transverse lamina on the lip, as in *D. eulophotum.*

Fig. 1, flower; 2, column; 3 & 4, anther; 5, pollinia:—*all enlarged.*

PLATE 11.

DENDROBIUM (*Strongyle*) TERES, *Lindl.*

D. teres; caule gracile elongato parce folioso, foliis remotis teretibus obtusis v. oblique truncatis, floribus in apicem caulis elongatum aphyllum longe vaginatum paucis brevissime pedicellatis albis, bracteis spathaceis, sepalis ovato-lanceolatis acuminatis, petalis angustioribus lineari-lanceolatis, mento sepalis breviore conico recto, labello sepalis breviore cuneato oblique truncato acuminato v. cuspidato serrulato disco 3-cristato. *Lindl. in Bot. Reg.* 1840 *Misc.* 51; *Hook. f. Fl. Brit. Ind.* v. 726.

HAB.—SINGAPORE *Hort.* Lindley; (*Ic. in Herb. Hort. Calcutta*).

Stems tufted, 6—18 in. long, as thick as a crow-quill, green, narrowed towards the base, clothed below with long brown sheaths; internodes about 1 in. *Leaves* 2—3 in., $\frac{1}{6}$ in. broad, straight, suberect, bright green, obtuse, or very obliquely truncate at the flattened apex, with a rather acute triangular point. *Flowers* few, fragrant, produced in the very long leafless apex of the stem, which is closely invested by two or more long appressed pale sheaths an inch long; pedicel very short, issuing from a short annular sheath (? bract); perianth rather narrow, $\frac{2}{3}$ in. long from the tip of the dorsal sepal to that of the mentum, which is yellow; lip white with pink veins.

In the Flora of British India I described this species from Lindley's diagnosis and a very imperfect leafless specimen. The fine drawing here reproduced enables me to amend the description; it is inscribed "Singapore; *Fl. in* H. B. C. 8-8-83."

Fig. 1, base, and 2, apex of leaf; 3, portion of stem and flower; 4, flower; 5, the same with the petals and sepals detached; 6 & 7, column and leaf:—*all slightly enlarged.*

PLATE 12.

DENDROBIUM (*Virgatæ*) PACHYGLOSSUM, *Reichb. f.*

D. *pachyglossum*; caulibus gracilibus cœspitosis, basi non incrassatis, foliis angustissime lineari elongatis patenti-recurvis acuminatis, vaginis superioribus hirtulis, floribus axillaribus solitariis v. 2-nis brevissime pedicellatis pendulis fusco-luteis striatis, sepalis 7-nerviis lateralibus oblongo- v. triangulari-ovatis, mento sepalis æquilongo obtuso, petalis anguste oblanceolatis acuminatis, labello oblongo lobis lateralibus obscuris apicem versus labelli insertis, terminali minuto retuso, disco 2-carinato. *Parish et Reichb. f. in Trans. Linn. Soc.* xxx. 149; *Hook f. Fl. Brit. Ind.* v. 727.

HAB.—TENASSERIM; at Moulmein, *Parish.* SINGAPORE (*Ic. in. Herb. Calcutta*).

Stem 6—10 in., rather flexuous, sheaths red-brown, lower inetrnodes 1—1½ in. *Leaves* 3—4 by $\frac{1}{12}$—$\frac{1}{8}$ in., grass-like, bright-green, dorsally convex, channelled above. *Flowers* from the lower axils, nearly ½ in. long; pedicel hardly any, with the ovary decurved, reddish. *Sepals* and 3-nerved *petals* dull yellow with brown streaks along the nerves, which are continued to the base of the mentum; lip as long as the sepals, thickish in texture, nearly straight, concave, dull pale yellow with a green tip, nerves faint. *Column* very large for the genus, stout, 3-toothed at the top.

The drawing here reproduced enables me to give a more complete description of this species than that contained in the Flora of British India. It is inscribed "Singapore, 14-5-68. Fld. March 1869." Possibly this is an error due to transposition of labels, a very common occurrence in gardens; for the only other known habitat of the species is Moulmein, whence I have seen specimens collected by Parish and accompanied by a drawing, which leaves no doubt of the identify of the supposed Singapore plant with his. The great length of the column is remarkable, and shows an affinity with *D. nutans* (see t. 18).

Fig. 1, flower; 2, the same with a sepal, petal, and lip detached; 3, column:—*all more or less enlarged.*

PLATE 13.

DENDROBIUM (*Virgatæ*) TENUICAULE, *Hook. f.*

D. tenuicaule; caule gracillimo elongato flexuoso internodio basilari minuto globoso, secundo et tertio gracilibus, quarto supra medium clavato, quinto incrassato tereti, sexto obverse clavato, reliquis 1—2-pollicaribus filiformibus, foliis apicem versus caulis paucis anguste lineari-elongatis, floribus apicem aphyllum versus caulis paucis solitariis albis v. pallide fulvis, sepalo dorsali oblongo obtuso 7-nervi lateralibus late ovatis obtusis, mento sepalis duplo longiore corniformo fere recto, petalis oblongis, labello cuneato membranaceo 3-lobo, lobis lateralibus rotundatis, terminali parvo orbiculari, disco pubescente. *Hook. f. Fl. Brit. Ind.* vi. 184.

HAB.—ANDAMAN ISLANDS, (*Ic. in Herb. Hort. Calcutta*).

Stems tufted, 10—12 in., very slender above, base swollen into a globose tuber emitting fibrous roots, two following internodes very slender, the next clavate ribbed, followed by a cylindric ribbed one an inch long, and this by an obversely clavate one, the rest all 1—1½ in. long, very slender, with appressed sheaths. *Leaves* on the young stems only, 3—5 in. long, slender and recurved, $\frac{1}{10}$ in. broad, acute. *Flowers* about ⅔ in. long from the tip of the dorsal sepal to that of the mentum, very membranous; petals as long as the dorsal sepal, nerve solitary with branching nervules. *Lip* delicately 5-nerved in the centre, the outer pair of nerves branching towards the margins. *Column* very short, 3-toothed; anther hemispheric.

As stated in the Flora of British India, this species is there described from the drawing here reproduced (which is inscribed "Andamans, Recd. 8-2-84, fld. in Hort. Bot. Calc. 30th April 1884"), and some detached flowers placed in a packet with the drawing. It seems to be quite distinct from any previously described, but it belongs to a very troublesome group with swollen lower internodes the characters afforded by which latter organs are not likely to be constant.

Fig. 1, flower with the lip removed, and 2, lip, both *enlarged*, are from sketches of my own of the flowers accompanying the drawing.

PLATE 14.

DENDROBIUM (*Pedilonum*) CROCATUM, *Hook. f.*

D. crocatum; caulibus teretibus elongatis foliosis, foliis lanceolatis acuminatis nervosis mollibus, racemis ad nodos rami aphylli paucifloris, pedunculo pedicilisque divaricatis gracillimis, bracteis parvis ovatis, floribus majusculis laete croceis, sepalis lateralibus ovato-oblongis acutis dorsali petalisque oblongis 7-nerviis, mento corniforme sepalis triplo longiore lente curvo, labello spathulato ungue angusto canaliculato basi squama recurva instructo lamina obovata crenulata. *Hook. f. Fl. Brit. Ind.* vi. 185.

HAB.—PERAK, at Larut (*Ic. in. Herb. Hort., Calcutta*).

Stem 2—3 ft., narrowed at the base, green; internodes 1 in., ⅓ in. diam. *Leaves* 4 by 1 in., bright green. *Racemes* pendulous, 2-fld. (in the drawing); peduncle ½—¾ in., with a short annular basal sheath; bracts green; pedicels with ovary about as long; flowers 1¼ in. long from the tip of the dorsal sepal to that of the long

spur-like mentum. *Lip* hardly recurved, as long as the sepals spotted with dark-red on each side towards the base of the blade, flabellately many-nerved; claw with a narrow median canal leading down to the short oblong recurved callus or scale.

A beautiful species, of which I have seen only the dried flowers accompanying the drawing. The latter is inscribed "Larut, Perak, Ic. Hort. Bot. Calc. Fl. 24-9-83."

Fig. 1, flower; 2, the same with the sepals and petals detached and lip removed; 3, lip from a drawing of my own:—*all more or less enlarged.*

PLATE 15.

DENDROBIUM (*Pedilonum*) PANDURIFERUM, *Hook. f.*

D. panduriferum; caulibus elongatis cylindraceis sulcatis, foliis in caulibus junioribus lanceolatis acuminatis, racemis in caulibus aphyllis axillaribus brevibus paucifloris, bracteis parvis, pedicellis divaricatis, floribus flavis rubro-punctatis, sepalis lateralibus late ovatis subacutis, mento in calcar elongatum sepalis multoties longius apicem versus subinflatum producto, petalis orbicularibus crenatis multinerviis, labello longissime anguste unguiculato limbo panduriforme medio valde constricto lobis lateralibus auriculæformibus, terminali late obcordato, disco ad basin loborum lateralium lamella transversa aucto. *Hook. f. Flor. Brit. Ind.* vi. 186.

HAB.—PEGU; at Rangoon, *Gilbert* (*Ic. in Herb. Hort. Calcutta*).

Stem 2—3 ft., narrowed at the base, no doubt pendulous; internodes 1—1½ by ¼ in., green, nodes often rooting; sheaths white, young green and speckled, membranous. Racemes 1—2 in.; bracts small; pedicel with ovary ½ in. and peduncle purplish; flower 1 in. long. *Sepals* and *petals* yellow or greenish, with red dots along the numerous nerves; mentum straight or slightly curved, streaked with red. *Lip* with the claw 3—4 times as long as the dull yellow limb, margins of claw incurved above, below connate with the sides of the mentum. *Column* very short; anther stipitate.

A remarkable species. The analyses fig. 1, flower, with the lip displaced; 2, petal; 3, lip; 4, column and anther; 5, anther—*all enlarged*—are from drawings of my own of some flowers contained in a capsule attached to the drawing. The latter is inscribed "Rangoon, Dom. Gilbert misit; Fl. in H. B. C. 19-11-84." It must be very nearly allied to the *D. ionopus*, Reichb. f. in Gard. Chron. 1882 ii. 508, from Burma, which has yellow flowers with red blotches and an elongate falcate mentum; but that species is described as having a thick keeled claw of the lip with a flat retrose tooth. The latter is a common character of the section *Pedilonum*, but I found no trace of it in the solitary lip of *D. panduriferum* which I was able to examine.

PLATE 16.

DENDROBIUM (*Pedilonum*) SERPENS, *Hook. f.*

D. serpens; caulibus longissimis gracilibus flexuosis basi tuberosis, internodiis 1—1½ pollicaribus medio sulcatis, racemis caulibus aphyllis ad nodos lateralibus brevibus plurifloris, floribus breviter pedicellatis, sepalis late ovatis obtusis petalisque late obovatis aureis rubro-striatis, mento viridi sepalis lateralibus duplo longiore tereti obtuso fere recto, labelli aurei ungue lineari limbo panduriforme medio modice constricto vix duplo longiore,

limbo basi squama transversa aucto. D. panduriforme, var. serpens, *Hook. f. Fl. Brit. Ind.* vi. 186.

HAB.—PERAK; *Kunstler* (*Ic. in Herb. Calcutta*).

Stem 2—3 ft., pendulous, green, internodes channelled and more or less twisted. *Leaves* not seen. *Racemes* 1½ in., about 6—8-fld.; peduncles short and rachis red-brown; pedicels with ovary about ⅓ in.; bracts very small, ovate, acute. *Sepals* and *petals* spreading, sub-acute, 5-nerved; mentum nearly straight, obtuse. *Lip* with the blade oblong, cordate above and below, slightly constricted in the middle.

In the Flora of British India, I have recorded this plant as a variety of *D. panduriferum*, adding that it may be Reichenbach's *D. ionopus.* A further examination of the drawing convinces me that it cannot be either the one or the other. From *D. panduriferum* it differs in the short pedicels, broadly obovate 5-nerved petals, much shorter mentum, and above all in the form of the lip, the blade of which is more oblong (not deeply constricted with auricle-like side-lobes), and obcordate midlobe and the claw is not even twice the length of the blade.

The drawing is inscribed "Kunstler misit ex Perak, Fl. in H. B. C. 7-5-84."

Fig. 1, front, 2, back view, and 3, side view of flower; 4, flower with the sepals and petals detached and lip removed; 5, lip:—*all enlarged.*

PLATE 17.

DENDROBIUM (*Pedilonum*) TROPÆOLIFLORUM, *Hook. f.*

D. tropæoliflorum; caule elongato flexuoso superne incrassato apicem versus pauci-foliato, foliis lineari-oblongis acutis, racemo subterminali plurifloro breviter pedunculato, sepalis triangulari-ovatis acutis, petalisque obovato-rotundatis acutis atro-purpureis, mento sepalis planis longiore cylindraceo obtuso aureo, labelli ungue elongato flavo sensim dilatato limbo multo longiore, disco inter lobos laterales callo magno semi-lunari instructo. *Hook. f. Fl. Brit. Ind.* vi. 186.

HAB.—PERAK, *Kunstler* (*Ic. in Herb. Hort. Calcutta*).

Stem 1 ft., incurved, slender below, tuberous at the base; roots fibrous; internodes ¾—1 in., grooved. *Leaves* 2½ by ⅔ in. *Raceme* 1—2 in., rachis slender, pink; bracts minute; pedicels with ovary ⅔ in.; flowers 1 in. *Sepals* and *petals* ½—⅓ in. long, dark red-purple; mentum four times as long as the sepals, nearly straight, broad, slightly undulate, obtuse. *Lip* small, narrow, about as long as the sepals, claw gradually dilated into the short lateral lobes, between which is the large semilunar callus, suddenly contracted into the obovate-oblong apiculate limb.

A very peculiar species, with flowers a good deal like those of *Tropæolum pentaphyllum.* I have seen no specimen, and have consequently described it from the drawing, which is inscribed "in H.B.C. Fl. 30-8-82, from Malaya, Perak, sent by Herr Kunstler," to which Mr. Brace (then keeper of the Herbarium) has added in a note, "the sides of the claw of the lip adhere to the sides of the mentum," which they do more or less in other species of the section *Pedilonum.*

Fig. 1, flower; 2, the same with the sepals and petals detached and lip removed; 3, lip:—*all of the natural size*, 4, lip, *enlarged.*

PLATE 18.

DENDROBIUM (*Eudendrobium*) NUTANS, *Lindl.*

D. nutans; caulibus cœspitosis inferne attenuatis, superne crassiusculis foliosis, internodis profunde sulcatis, foliis breviusculis lineari-oblongis lanceolatisve acutis obtusis v. sub-bilobis pubescentibus, racemis brevibus axillaribus paucifloris, pedunculo brevi basi vaginato, floribus nutantibus flavis, sepalis petalisque lineari-lanceolatis, mento conico sepalis dimidio breviore, labello sepalis æquilongo lineari-lanceolato lobis lateralibus parvis rotundatis, epichilio hypochilio æquilongo concavo acuto marginibus undulatis incurvis, disco 5-nervi, columna longiuscula. *Lindl. Gen. and Sp. Orchid.* 90 *et in Bot. Reg.* 1844, Misc. 52. *Thwaites Enum. Pl. Zeyl.* 298 (excl. syn. Jerdonianum), *Hook. f. Fl. Brit. Ind.* v. 734. D. villosulum, *Lindl. Gen. and Sp. Orchid.* 86, *in part.*

HAB.—CEYLON; in the Central Province, alt. 4—6,000 ft., *Macrae, &c.* NILGHIRI HILLS, at Ootacamund (*Ic. in Herb. Hort. Calcutta*).

Stems tufted, 6—10 in., sometimes rather swollen towards the middle, but hardly clavate. *Leaves* 2—2½ by ⅙—⅓ in., spreading and recurved, rather coriaceous. *Raceme* 2—4-fld.; peduncle ½ in., leaf-opposed; pedicel with ovary ¾ in.; bracts minute; flower ⅔ in. long, narrow. *Column* rather long for the genus. *Capsule* sub-clavate, ⅔ in. long.

Lindley describes the peduncles as subterminal, and the flowers as white tinged with green, probably from a cultivated specimen; but in an excellent drawing made by Mrs. Walker in Ceylon, they are, as represented here, of a pale rather buff yellow. Thwaites has referred to this the Peninsular *D. Jerdonianum*, Wight (Ic. t. 1614), and no doubt the species are nearly allied, if not varieties of one; but in that the stems are much more robust, the leaves deeply acutely cleft at the broad apex, and the flowers larger. The drawing here reproduced is inscribed "D. Jerdonianum, Wight, Ootacamund, ⅙ in., fld. in H. B. C. Feb. 1863, T. A." The length of the column is remarkable, as noticed under *D. pachyglossum* (Plate XII).

Fig. 1, flower; 2, the same with the sepals and petals removed; 3, lip; 4, anther; 5, pollinia; 6, capsule 7, the same cut transversely:—*all but figs.* 6 *and* 7 *enlarged.*

PLATE 19.

DENDROBIUM (*Eudendrobium*) CANDIDUM, *Wall.*

D. candidum; caulibus cœspitosis gracilibus erectis basi attenuatis, foliis lanceolatis acutis, floribus in caulibus aphyllis breviter racemosis albis, pedunculo brevi vaginato, bracteis majusculis ovatis concavis, sepalis petalisque lineari-oblongis obtusis, mento brevi rotundato, labello sepalis breviore ovato-lanceolato obtuso basi cuneato lobis lateralibus angustis rotundatis, disco barbato callo elongato instructo. *Wall. in Lindl. Bot. Reg.* 1838, *Misc. n.* 54; *Paxt. Fl. Gard.* i. 63, *f.* 41; *Hook. f. Fl. Brit. Ind.* v. 735.

HAB.—TROPICAL and SUB-TROPICAL HIMALAYA, from Kumaon, alt. 3,000 ft., to Sikkim, ascending to alt. 7,000 ft., and Bhutan. KHASIA HILLS, *Gibson.*

Stems tufted on a short stout creeping rhizome; internodes 1—1½ in., striate; leafless stems with long fibrous remains of the leaf-sheaths at the nodes. *Leaves* 3—5 by ⅓ in., spreading and recurved. *Racemes* at the nodes; peduncle ¼—⅔ in., rather stout; sheaths

short; bracts $\frac{1}{6}$ in.; pedicels with ovary $\frac{2}{3}$ in.; flower 1—1$\frac{1}{4}$ in. across the spreading subfalcate lateral sepals, very fragrant, pure white. *Lip* yellowish towards the base.

A beautiful species and very fragrant. I have seen no Khasian specimens; but the drawing here reproduced is inscribed "D. candidum, Wall., Mr. Gibson's collections; grows erect like D. nobile." Mr. Gibson was a collector in the Khasia, sent out by the Duke of Devonshire about the year 1834, and who, according to Lindley (Bot. Reg.), discovered D. candidum at Nungklow in the Khasia hills.

Fig. 1, flower with the perianth segments detached; 2, lip; 3, anther; 4, pollinia:—*all enlarged*.

PLATE 20.

DENDROBIUM (*Eudendrobium*) STUPOSUM, *Lindl.*

D. stuposum; caulibus elongatis sulcatis, foliis lineari-oblongis lanceolatisve acutis, floribus paucis in caulibus aphyllis racemosis albis, pedunculo gracili vaginato, sepalis oblongis acutis lateralibus carinatis, petalis late oblongis acutis erosis, mento brevi rotundato, labello obovato-oblongo v. sub-cuneato villoso et glanduloso-ciliato lobis lateralibus brevibus terminali rotundato. *Lindl. Bot. Reg.* 1838, *Misc.* 52 *et* 1844, *Misc.* 52, *Hook. f. Fl. Brit. Ind.* vi. 186. D. sphegidoglossum, *Reichb. f. in Bonplandia* ii. 58; *Hook. f. l. c.*, v. 737.

HAB.—KHASIA HILLS, alt. 3—5,000 ft. (*Ic. in Hort. Calcutta.*). TENASSERIM, *Parish.*

Stems tufted, 6—12 in., internodes 1—1$\frac{1}{2}$ in. *Leaves* 3—4 by $\frac{2}{3}$ inch, rather thin. *Racemes* at the nodes. *Peduncle* slender, 1$\frac{1}{2}$ in., with short scattered green sheaths; bracts linear-oblong, obtuse, green; pedicel with ovary $\frac{1}{4}$—$\frac{1}{3}$ in.; flowers $\frac{1}{2}$ in. long. *Lip* nearly as long as the sepals, concave, not recurved, white with red veins and a yellow transverse band.

The specimen figured, which is inscribed "introduced from the Khasia Hills in 1867, fld. on 1st June 1868," differs from the description in the Flora of British India in the smallness of the lateral lobes of the lip, or rather in the greater breadth of the terminal lobe, and in wanting the red veins and yellow band which are represented in a drawing of the Tenasserim plant by Mr. Parish. That the drawing cannot be altogether relied upon is evinced by the sepals and petals being represented as acuminate in the flowers of the natural size, and with rounded tips in the enlarged figures 1 and 2; the latter being the more correct. By inadvertence I have in the Flora of British India (*V.* 737) adopted Reichenbach's later name of *sphegidoglossum*, which is corrected at p. 186 of Vol. VI.

Fig. 1, flower; 2, the same with one sepal and petal removed; 3, lateral sepal; 4, lip:—*all more or less enlarged.*

PLATE 21.

DENDROBIUM (*Eudendrobium*) AURANTIACUM, *Reichb. f.*

D. aurantiacum; caulibus cœspitosis elongatis sulcatis, internodiis elongatis, foliis paucis lineari-oblongis apice emarginatis, floribus in caulibus aphyllis amplis aurantiacis v. aureis solitariis v. binis apicem versus pedunculi validi curvi vaginis coriaceis imbricatis tecti, bracteis elongatis spathaceis, sepalis lateralibus oblongis v. oblongo-lanceolatis acuminatis, petalis latioribus ovato-oblongis obtusis, mento brevi late conico apice rotundato, labello late unguiculato orbiculari marginibus eversis disco pubescente marginibus

erosis v. subfimbriatis. *Reichb. f. in Gard. Chron.* 1887 ii. 98; *Hook f. Fl. Brit. Ind.*, v. 751, vi. 187. D. aurantiacum, *Rolfe in Gard. Chron.* 1888, i. 233. *Hook. f. l. c.*, v. 748.

BHOTAN HIMALAYA (*Ic. in Herb. Hort. Calcutt.*). ASSAM (*Hort. Veitch*). SYLHET, *Melville* (*in Herb. Kew*).

Stems 1—2 ft., about $\frac{1}{4}$ in. diam.; internodes 1—1$\frac{1}{2}$ in. *Leaves* 2—3 by $\frac{1}{3}$—$\frac{1}{2}$ in., spreading and recurved. *Racemes* solitary from the upper and lower nodes; peduncle 1—2 in., curved to one side; sheaths tubular, obliquely truncate, green and brown spotted, pedicel with ovary 1$\frac{1}{2}$ in. decurved; bracts $\frac{1}{2}$—$\frac{3}{4}$ in., obtuse, membranous, white; flowers 1$\frac{1}{2}$ in. diam. *Petals* broader than the sepals; lip with sometimes faint crimson streaks at the base. *Column* very short; anther taller than broad, tip 2-lobed.

A very fine species, first described by Reichenbach from specimens flowered by Veitch, and said to have been imported from Assam, probably the Khasia hills or Bhotan. The drawing is inscribed "Sylhet, April 1875. Mr. Melville, G. King." The same from Dewangiri, Bhotan, "G. S. Jennings, April 1866, J. Anders." In the drawing the unnumbered enlarged figure of the lip is represented as having two small inflexed lobes above the claw, which I did not detect, and I suspect that they are due to laceration.

Fig. 1, flower with the sepals and petals detached and lip removed; 2, ovary and column; 3, anther; 4 and 5, pollinia:—*all enlarged.* The two unnumbered figures are a bract and the lip:—*both enlarged.*

PLATE 22.

DENDROBIUM (*Eudendrobium*), PALPEBRAE, *Lindl.*

D. palpebrae; pseudobulbis clavatis sub-tetragonis profunde canaliculatis, foliis terminalibus oblongo-lanceolatis acutis, racemis breviter pedunculatis multifloris pendulis v. nutantibus, bracteis parvis lanceolatis pedicello appressis, floribus amplis, sepalis oblongis obtusis petalisque breviter unguiculatis orbiculatis ciliolatis candidis v. pallido roseis, mento parvo rotundato, labello amplo explanato breviter unguiculato late oblongo pubescente et villoso-ciliato albo plaga basin versus lata lutea. *Lindl. in Journ. Hort. Soc.* v. 33; *Paxt. Fl. Gard. i.* 48; *Veitch Man. Dendrob.* 67; *Hook. f. Fl. Brit. Ind.*, v. 750.

HAB.—SIKKIM HIMALAYA; in the Teesta valley (*Ic. in Herb. Hort., Calcutta*). BURMA; *Lobb, Berkeley.*

Stems 6—9 in. long; internodes about 6, the upper 1 in. diam., bright green, deeply channelled, ribs rounded. *Leaves* 3—5, 4—6 in. long by 1—1$\frac{1}{2}$ broad, bright green, coriaceous, flat. *Raceme* inserted towards the base of the pseudobulb, nearly a foot long, many-flowered; peduncle short, stout, decurved, with several short obtuse brown striate sheaths, rachis green; bracts $\frac{1}{6}$—$\frac{1}{4}$ in. long, white or pink; pedicel with ovary 1$\frac{1}{2}$ in., slender, pink; flowers 2 in. diam. *Sepals* and *petals* pure white, or flushed with pink, faintly many-nerved, the petals twice as broad and rather shorter than the lateral sepals; lip oblong when spread out, the basal part convolute, the rest forming an orbicular softly pubescent and sub-fimbriately margined limb 1 in. diam., white with a broad golden area in the centre and base. *Column* very short.

It is singular that this beautiful plant, though introduced into England by Messrs. Veitch from Moulmein previous to 1849, should never have been figured in any published work on orchids. The drawing here reproduced is inscribed "Garden of Mr. Lynam, March 1867, T. Anders. The same from Teesta valley on sál trees, March 1867, T. A." It must be a very rare plant, having hitherto been found nowhere but once in Sikkim, and by two collectors in Burma.

Fig. 1, flower: 2, column with anther; 3, anther; 4, pollinia:—*all enlarged.*

PLATE 23.

Bulbophyllum (*Eubulbophyllum*) polyrhizum, *Lindl.*

B. polyrhizum; pseudobulbis parvis dense cœspitosis globoso-ovoideis florentibus aphyllis, scapo basi pseudobulbi gracili erecto, racemo laxifloro, bracteis minutis, floribus brevissime pedicellatis parvis flavis, sepalis lateralibus oblongis subfalcatis obtusis, petalis ovato-oblongis obtusis, labello sessili ovato obtuso, columnæ dentibus brevibus. *Lindl. Gen. and Sp.. Orchid*, 53; *Hook. f. Fl. Brit. Ind.* v. 767.

Hab.—Nepal? *Wallich* (*Ic. in Herb., Kew*). Sikkim; *Lister* (*Ic. in Herb. Hort. Bot. Calc.*).

On Plate 23 are represented two plants, which may be different, but which agree so closely in the structure of their flowers that they are more probably varieties. Both have densely clustered small pseudobulbs about the size of hazel nuts, apparently forming matted masses on the trunks of trees, leafless at flowering time, and bearing very slender scapes with lax racemes of small yellow flowers. That figured as B is from a collection of drawings received at Kew from the India House, on the Indian Government being taken over by the State. It is inscribed "*Dendrobium polyrhizum, Wall. Ærides?*" in Wallich's handwriting, and is no doubt the type of the species. It has smooth, striated pseudobulbs, and the flowers are greenish. That marked A is from the Calcutta collection of orchid drawings, and is inscribed "Sent from Sikkim by Mr. Lister, fld. in H. B. C., 4th April 1877, G. King." It represents a plant with more oblong-ovate pseudobulbs, twice, rarely thrice, constricted transversely, as if formed of three internodes, and these internodes are vertically traversed by many deep grooves with tumid interspaces, the whole pseudobulbs having (as drawn) somewhat the appearance of three superposed rows of green oblong beads. The pseudobulbs further emit surculi from their bases, which are not shown in the other drawing. In both the base of the pseudobulb is copiously supplied with fibrous roots. To identify specifically figure A with B it is necessary to suppose that the pseudobulbs of the former are old and shrivelled, allowing something also for the fancy of the native artist. With regard to the difference in the size and colour of the flowers, here, again, too much reliance must not be placed on the artist's work. The flowers of A are evidently giving place to fruit, and though its sepals are represented as acuminate in the drawing of the natural size, and at figure 1 of the analyses, they are not so in the enlarged figure 2, the sepals of which accord sufficiently well with those of B2 and 3. The sessile lip is the same in both, as are the short teeth at the top of the column. The proximity of Sikkim to Nepal is a further indication of the two figures representing different states of one species.

I have only further to observe that the figures in the plate represent but very small portions of great masses depicted in the original drawings of both, and that it must be left to future observers to clear up any remaining doubts as to whether A is a distinct species or variety, which in either case, if the drawing be faithful, might bear the name of *zonale*.

Fig. A, the Sikkim plant; Fig. 1, flower; 2, the same with the sepals and petals detached; 3 and 4, anther; 5, pollinia:—*all enlarged.*

Fig. B, the Nepal plant (B. polyrhizum, Wall.); B1 and 2, flowers; B3, the same with the sepals and petals detached:—*all enlarged.*

PLATE 24.

BULBOPHYLLUM (*Eubulbophyllum*) EUBLEPHARUM, *Reichb.*

B. eublepharum; pseudobulbis elongato-ovoideis teretibus monophyllis, foliis breviter petiolatis lineari-oblongis acutis coriaceis, scapo ascendente elongato robusto, spica laxiflora, bracteis ovario æquilongis aristatis, sepalis ovato-lanceolatis longe acuminatis albis v. viridibus punctatis, petalis columnæ æquilongis oblongis eroso-fimbriatis albis punctatis, labello stipitato late ovato recurvo purpureo, columnæ dentibus elongatis erectis. *Reichb. f. in Walp. Ann.* vi. 252; *Hook f. Fl. Brit. Ind.* v. 764.

HAB.—SIKKIM HIMALAYA, alt. 7—10,000 ft.

Pseudobulbs 2—3½ in. *Leaves* 4—8 in., sometimes loriform. *Scape* with spike 12—18 in., ascending, with a few long appressed sheaths toward the base and scattered empty green lanceolate bracts below the spike; spike 4—6 in. long, inclined; bracts ⅕ in., green. *Sepals* ¼—⅓ in. long, concave; mentum rounded; petals about ⅓ as long as the sepals. *Lip* cordate at the base, strongly recurved, obtuse.

This is perhaps the only species of *Bulbophyllum* that attains to 10,000 ft. elevation. The drawing reproduced here is from a Sikkim specimen, and is inscribed "From Tonglo, alt. 10,000 ft., Aug. 1862. T. Anderson. Luchman Singh delt." Griffith's specimens (brought by collectors in Sikkim) have leaves 8 by 1½ in., and flowers larger than in the drawing.

Fig. 1, side and 2, front view of flower; 3, the same with sepals and petals removed; 4, anther; 5, pollinia—*all enlarged from the specimen drawn.* Fig. 6, enlarged flower with a lateral sepal and a petal removed, from a drawing of my own of a flower taken from Griffith's specimen.

PLATE 25.

CIRRHOPETALUM (*Racemosæ*) BLEPHARISTES, *Hook. f.*

C. Blepharistes; pseudobulbis in rhizoma elongatum robustum remotis oblongis ovoideisve teretibus v. uno latere sulcatis 1—2 phyllis, foliis oblongis lineari-oblongisve emarginatis crassissimis, scapis elongatis gracilibus decurvis, rachi incrassato, floribus magnis breviter racemosis, sepalis viridibus rubro-striatis, lateralibus in laminam ovato-lanceolatam acutam connatis, dorsali lanceolato bis terve longiore, petalis late oblongis obovato-cordatisve fimbriatis 5—10 nerviis aureis apicibus rubro-punctatis, labello sessile recto oblongo apice rotundato basi dilatato cordato, columnæ dentibus minutis. *Hook f. Fl. Brit. Ind.* v. 779; vi. 190. Bulbophyllum Blepharistes, *Reichb. f. in. Trans. Linn. Soc.* xxx. 138.

HAB.—KHASIA HILLS, *Badgeley* (*Ic. in Herb. Hort. Calcutta*). TENASSERIM, *Parish.*

Rhizome as thick as a duck's quill, rooting at the bases of the pseudobulbs, articulate. *Pseudobulbs* 1½—3 in., smooth, green, with sometimes a superadded node. *Leaves* 2—3 in., sessile or shortly petioled. *Scape* 6—12 in., with distant green appressed sheaths, often deflexed with the umbel erect; bracts minute, triangular, persistent, green; pedicels with ovary ¾ in., slender. *Sepals* 7-nerved; lateral ⅔ in., base of combined pair subcordate, dorsal variable in length; petals very small; lip yellowish, mottled with red, not recurved. *Column* very short, apex dorsally toothed.

This is one of the few species of *Cirrhopetalum* that may be referred to that genus or to *Bulbophyllum*, according to whether the dorsal sepal is considered to be long or short. In the case of the specimen figured it would, but for its habit, be referred to the latter genus, as it was by Reichenbach. As I have stated in the Flora of British India (v. 772), the species of *Bulbophyllum* and *Cirrhopetalum* are in many cases so closely allied by cross affinities that the two genera might well be regarded as one. My keeping them apart is due to the consideration of convenience, and the fact that all my attempts to commingle the species of both has resulted in a chaotic aggregate with most unsatisfactory sectional characters; in fact a far less satisfactory result than the keeping them apart, which latter course avoids a greatly increased synonymy.

The drawing of the Khasian specimen here figured is inscribed "Khasia hills, Capt. Badgeley, fld. H. B. C., January 1878"; the flowers are much larger and the dorsal sepal far longer than in the Tenasserim specimens.

Fig. 1, flower; 2, dorsal and 3, lateral sepals; 4, petals; 5, column; 6, lip; 7, 8, anther; 9, pollinia; 5, ovary and column:—*all enlarged.*

PLATE 26.

CIRRHOPETALUM (*Umbellatæ*) GAMOSEPALUM.

C. gamosepalum; pseudobulbis in rhizomate repente subremotis ovoideis angulatis, foliis obovatis lineari-obovatis-oblongisve emarginatis v. bilobis crasse coriaceis, scapo gracili pendulo multifloro, bracteis lanceolatis pedicillis brevibus brevioribus viridibus, sepalo dorsali ovato in aristam ciliatam angustato aureo-rubro-striato producto, lateralibus dorsali subtriplo longioribus linearibus apice rotundatis in laminam lineari-oblongam planam roseo-purpuream cohærentibus, petalis sepalo dorsali fere aquilongis ciliatis et in aristam ciliatam productis rubro-punctatis, labello subsessile lineari-oblongo obtuso recurvo purpureo, columnæ angulis rotundatis. *Griff. Notul.* iii. 296; *Hook. f. Fl. Brit. Ind.* v. 774. C. Andersonii, *Kurz in Rep. Veg. Andam.* 51 (*nomen*). Bulbophyllum Griffithianum, *Par. and Reichb. f. in Trans. Linn. Soc.* xxx. 153.

TENASSERIM—*Griffith, Parish.* ANDAMAN ISDS., *Kurz.* PERAK, *Scortechini.* MALACCA, *Maingay.*

Rhizome as thick as a crow-quill, closely articulate. *Pseudobulbs* $\frac{2}{3}$—1 in. long, green, 4-angled. *Leaves* $2\frac{1}{2}$-4 in., subpetiolate, dark green. *Scape* 4—6 in., very slender, brown-purple, sheaths small appressed; bracts $\frac{1}{6}$ in., green; pedicels with ovary about twice as long; flowers $\frac{3}{4}$—1 in. long. *Dorsal* sepal suberect, lateral cohering as a flat rose-purple blade with a rounded entire or crenate tip, each 5-nerved.

Notwithstanding Griffith's description of the rhizome of his *C. gamosepalum* as filiform, I feel sure that I was right in referring to it Kurz's *C. andamanicum*; and the drawing here given confirms this view. Except in colour, I find no other difference except in the lip, which Griffith describes as acuminate. The dorsal sepal and petal he describes as blood-red; the former greenish at the base and the lateral as closely dotted at the base with purple; and the column as white with black-purple spots. Reichenbach in his very imperfect diagnosis of *Bulb. Griffithianum* describes the leaves and lateral sepals as acute, and omits the ciliate awned apices of the dorsal sepal and petals. Following him I described the lateral sepals as acute (Fl. Brit. Ind.), but I feel sure that they are only so through shrivelling. I gather from an observation in his diagnosis that Parish had suggested its being *C. gamosepalum*. The latter says the flowers are white streaked with brown.

I think it probable that *C. gamosepalum* is a littoral species, as it extends from Tenasserim to Malacca and the Andamans. The drawing here reproduced was from an Andaman specimen which flowered in the Calcutta Garden. There are specimens in Herb. Kew from all the given localities, except from Griffith's of Mergui (in Tenasserim).

Fig. 1, flower, side view; 2, do., front view; 3, flowers with the lateral sepals removed and the dorsal and petals displaced; 4 and 5, lateral sepals; 6, lip; 7, anther; 8, pollinia:—*all enlarged.*

PLATE 27.

CIRRHOPETALUM (*Umbellatæ*) CŒSPITOSUM, *Wall.*

C. cæspitosum; pseudobulbis confertis ovoideis, foliis petiolatis lanceolatis oblongo-lanceolatisve acutis, scapo foliis breviore, vaginis brevibus laxis, umbella confertiflora, floribus flavis v. virescentibus, sepalo dorsali cymbiforme v. orbiculare galeato 5-nervi petalisque erosis, lateralibus liberis dorsali ter longioribus lineari-lanceolatis obtusis, petalis ovato-oblongis v. orbiculari-ovatis subacutis sepalo dorsali aquilongis 3-nerviis, labello breviter stipitato minuto ovato basi dilatato cordato obtuso aureo basi purpureo arcte reflexo, columnæ dentibus acicularibus erectis. *Wall. in Bot. Reg.* 1838, *Misc.* 35 *et* 1843 *sub. t.* 49; *Hook. f. Fl. Brit. Ind.* v. 775. Bulbophyllum scabratum, *Reichb. f. in Walp. Ann.* vi. 259.

HAB.—KHASIA HILLS, *Griffith, Gibson.*

Pseudobulbs ½—1 in., dark green, purplish at the top, smooth. *Scape* 2 in., slender, inclined, red-brown; bracts ¼ in., lanceolate, shorter than the ovary, which with the pedicel is ¼ in.; flowers ½—⅔ in. long, papillose. *Dorsal sepal* apiculate, lateral with involute margins, nerves of petals flexuous.

The hairs on the dorsal sepal and petals of the drawing are intended to represent the cellular or papillose erose texture of these organs. The different colour of the flowers of the specimen figured and the enlarged one is not easily accounted for, and the enormous column represented at fig. 3 is quite unlike that of any species of the genus known to me. On the other hand, the habit of the plant is entirely that of *C. cæspitosum*, assuming that the flowers have not spread in an umbellate form, as they should do.

The drawing here reproduced is inscribed "Cirrhopetalum cœspitosum, Mr. J. Gibson, 1836" in Wallich's writing. The figure differs from Lindley's description in the dorsal sepal being ciliate and not scabrid, and in the petals not being pectinately serrate, also in the large size of the lip. In the Flora of British India the lateral sepals are described as obtuse.

Fig. 1, flower; 2, petal; 3, column and lip; 4, pollinia:—*all enlarged.*

PLATE 28.

CIRRHOPETALUM (*Racemosæ*) REFRACTUM, *Zollinger.*

C. refractum; pseudobulbis diphyllis confertis ovoideis v. conicis, junioribus globosis senioribus sæpe lobatis, foliis sessilibus lanceolatis acutis, scapo suberecto pauci-v. multifloro, floribus sub-spicatis remotis 2-pollicaribus, bracteis ovario brevi longioribus ovato-lanceolatis, sepalis lateralibus dorsali minuto lanceolato aristato ciliato multoties longioribus anguste loriformibus in laminam planam auream rubro-striatam cohærentibus,

petalis rubris ovato-lanceolatis longe acuminatis ciliatis et pubescentibus sepalo dorsali minoribus, labello minuto oblongo hispidulo v. glabrato, columnæ calcaribus elongatis decurvis. *Zollinger in Flora* 1847, 457; *Walp. Ann.* i., 776; *Hook. f. Fl. Brit. Ind.* v. 779. C. Wallichii, *Lindl. in Wall. Cat.* 1980 *et in Bot. Reg.* 1839, *Misc.* 71 *et* 1843 *sub. t.* 49 (*non Wall. Pl. As. Rar.*). C. tripudians, *Par.* and *Reichb. f. in Gard. Chron.* 1876, 817. Bulbophyllum tripudians, *ejusd. in Trans. Linn. Soc.* xxx. 154. B. refractum, *Reichb. f. in Walp. Ann.* vi. 259.

HAB.—SUBTROPICAL HIMALAYA; from Kumaon alt. 3,700 ft., *Strachey and Winterbottom*, to Sikkim, alt. 4—5,000 ft., J. D. H., &c. TENASSERIM, *Parish.* DISTRIB. JAVA.

Pseudobulbs very variable, ¾—1 in. diam., young often nearly globose, old deeply lobed at the sides. *Leaves* 2 on young pseudobulbs, 4—5 in. long, rather flaccid. *Scape* 4—6 in., stout or slender, often red-brown, sheaths few, appressed; spike usually inclined or nodding, with 3—10 spreading or drooping flowers; bracts cymbiform, broadly ovate; ovary about ⅙ in. long. *Dorsal* sepal ⅙ in., yellow streaked with red; lateral remote at their bases, margins glabrous or ciliate; petals purplish red; lip subcylindric, streaked and speckled with red-purple, tip thickened incurved.

A very singular species, quite unlike any other, remarkable also for its wide distribution, being one of the few epiphytic orchids that inhabit both the Himalayas and Java. The specimen and figures from native specimens, of which I have seen several, show a good deal of variation in the form and colouring of the bracts and perianth segments. The drawing here reproduced is of a Sikkim specimen inscribed "Bolb. above Kurseong, 5,500 ft., 4th October 1876, G. King."

Fig. 1, flower; 2, lateral sepals; 3, dorsal sepal; 4 and 5, petals; 6, column and lip; 7, lip; 8, front view of column 9, anther; 10, pollinia:—*all enlarged.*

PLATE 29.

PANISIA PARVIFLORA, *Lindl.*

P. parviflora; pseudobulbis ovoideis reticulatis diphyllis, foliis subpetiolatis elliptico-lanceolatis acutis, scapo brevi gracile decurvo, racemo pendulo, floribus albis, sepalis lateralibus lanceolatis acutis 5-nerviis, dorsali lineari-oblongo, petalis ovato-lanceolatis 3-nerviis basi gibbis, labello lanceolato ungue elongata gracili geniculata apice 2-tuberculata. *Lindl. Fol. Orchid.* 1; *Hook. f. Fl. Brit. Ind.* v. 783. P. reflexa, *Lindl. l.c.* Cœlogyne parviflora, *Lindl. Gen. and Sp. Orchid.* 44. Dendrobium demissum *Don Prodr.* 34.—Androgyne, *Griff. Notul.* iii. 279.

HAB.—SUBTROPICAL HIMALAYA; Nepal, *Wallich*; SIKKIM, alt. 4—10,000 ft., *Clarke.* KHASIA HILLS, *Griffith, &c.*

Pseudobulbs broad or narrow, ½—¾ inch long, pale green, with slender, pubescent, branching roots from the base. *Leaves* 2—3 in. *Scape* 1—2 in.; raceme laxly few or many-fld.; bracts ⅓ in., lanceolate, shorter than the ovary, brown, membranous, deciduous; pedicel with ovary ½ in. *Sepals* and *petals* pure white; lip very narrow, 3-nerved, acute; claw variable in length, sometimes more than half as long as the blade. *Column* as long as the sepals, slender below, gradually dilating upwards into

two entire or toothed wings, pale yellow brown. *Anther* notched at the tip; pollinia 4, connected by a viscus. *Capsule* $\frac{1}{3}$ in. long, turgidly obovoid.

Though known for upwards of 70 years—for Wallich sent specimens to England early in the century—this interesting little orchid has never yet been cultivated in England, nor has a figure of it been published in Europe. That here given is from a Sikkim specimen collected by Dr. King at 6,000 feet elevation, 25th October 1876. The analyses A 1—5 are by myself from a specimen sent by Dr. Wallich to Sir James Smith about 1821, and given by the latter to Sir W. Hooker.

Fig. 1, flower with the lateral sepals and lip turned down; 2, flower with the sepals and petals detached; 3, ovary and column; 4, lip; 5 and 6, anther; 7, pollinia, *enlarged*:—all from the Sikkim drawing.

A1, dorsal and A2, lateral sepal; A3, petal, A4, column and lip; A5, *enlarged*:—all from Wallich's Nepal specimen.

B, lip of *Panisia apiculata*, Lindl., from Moolyet, Tenasserim, *Parish*, from a drawing of my own. It is the only other species of the genus, and differs remarkably in the form of the lip from P. *parviflora*.

PLATE 30.

Eria (*Hymeneria*) obesa, *Lindl.*

E. *obesa*; pseudobulbis dense congestis crassis fusiformibus basi attenuatis vaginis hyalinis tectis, foliis lanceolatis v. ovato-lanceolatis, racemis lateralibus sessilibus v. breviter pedunculatis paucifloris pubescentibus, bracteis patulis ovatis herbaceis, floribus albis roseo-striatis, sepalis lateralibus falcato-decurvis lanceolatis acuminatis, mento breve, petalis oblongo-lanceolatis, labello lineari-oblongo lobis lateralibus parvis v. obsoletis, disco 3-carinato. *Lindl.* in *Wall. Cat. n.* 1976 *et Gen. and Sp. Orchid* 68 *et Bot. Reg.* 1844 *sub. t.* 29 *et* in *Journ. Linn. Soc.* iii. 53; *Walp. Rep.* vi. 277.; *Hook. f. Fl. Brit. Ind.* v. 794. E. Lindleyana, *Griff. Notul.* iii. 300.

Hab.—Martaban, *Wallich.* Tenasserim; at Mergui, *Griffith*, *Parish.*

Pseudobulbs 2—3 in. by $\frac{1}{2}$—$\frac{2}{3}$ in. diam., curved, spindle-shaped, narrowed at the base of 4—6 principal nodes and a few very short small basal ones, pale silvery green from the transparent hyaline reticulate sheaths. *Scapes* several from each pseudobulb, with the sub-corymbose raceme 2 in. long; bracts $\frac{1}{4}$—$\frac{1}{3}$ in., green; pedicel with ovary $\frac{1}{2}$—$\frac{2}{3}$ in., slender. *Sepals* $\frac{1}{2}$ in. long, lateral spreading and decurved, more or less pubescent, very acuminate, dorsal recurved; mentum green, pubescent; petals $\frac{1}{3}$ shorter than the sepals; lip nearly as long as the sepals. *Capsule* 2 in., very slender, straight.

A singular species, remarkable for the pale sausage-shaped crowded glistening green pseudobulbs. There is no indication on the drawing of the locality whence the specimen was procured or of the collector, it being simply inscribed "*E. obesa*, Falc.," implying that the drawing was made during Dr. Falconer's superintendence of the Calcutta garden.

Fig. 1, side and 2, back views of flower with the lip removed; 4, dorsal sepal; 5, lip; 6 and 7, anther; 8, pollinia:—*all enlarged.*

Fig. A1, lip, *enlarged.* A2 fruit of the *natural size*, from Mr. Parish's specimen in Herb. Kew.

PLATE 31.

ERIA (*Hymeneria*) CLAVICAULIS, *Wall.*

E. clavicaulis; caulibus elongatis subclavatis sulcatis apices versus foliosis et floriferis, foliis 2—4 elliptico-lanceolatis acuminatis, pedunculis brevibus 2-3-floris, bracteis magnis ellipticis oblongisve patentibus, pedicellis elongatis, sepalis lateralibus triangulari-ovatis acutis recurvis, mento brevi lato 2-lobo, petalis late oblongis obtusis 5-nerviis, labelli hypochilio late obcordato v. fere reniforme, lobis rotundatis, disco callo elongato tomentoso simplice v. basi 3-fido instructo, epichilio parvo orbiculari sinu hypochilii fere incluso area centrali incrassata tomentosa. *Wall. ex Lindl. Bot. Reg.* 1840, *Misc.* 90 (*non. Journ. Linn. Soc.*); *Walp. Ann.* vi. 278; *Hook. f. Fl. Brit. Ind.* v. 799. E. khasiana, *Lindl. in. Journ. Linn. Soc.* iii. 59.

HAB.—KHASIA HILLS, *Griffith.*

Stems 6—10 in., very narrow at the base, gradually thickening upwards to $\frac{1}{3}$ in. diam., many grooved; internodes 3—5, 2 in. long, each with a short appressed brown ovate sheath that does not embrace the stem, pale-green and speckled with darker. *Leaves* 3—4 in., spreading and reflexed. *Peduncle* $\frac{1}{2}$—1 in., with broad basal sheaths; bracts $\frac{1}{2}$—1 in., many-nerved, membranous, spreading; flowers glabrous, white, lip with purple margins, and yellow disk. *Sepals* $\frac{1}{2}$ in. long; petals nearly as large as the sepals; lip variable in the breadth of the hypochil and size of the epichil. *Column* rather long and slender.

No habitat is given for the original *E. clavicaulis*, which was sent by Wallich with the mss. name, to the Royal Horticultural Society previous to 1840, where it flowered and was described by Lindley in the latter year. There are, however, specimens amongst Griffith's collections from the Khasia Hills. The drawing reproduced here has no indication of its native country, bearing only "Flowered in H. B. C., 21st February 1866, *T. Anderson.*"

Fig. 1, side and 2, front view of flower; 3, ovary and column; 4, anther; 5, pollinia:—*all enlarged.*

Fig. A 1, lip and column; A 3, side view of column; A 4, anther viewed facing the cells, A 5, pollinia:—*all enlarged* from Griffith's dried specimens. Fig. A 2, lip from a cultivated specimen in *Herb. Kew*, from Farley Hall.

PLATE 32.

ERIA (*Dendrolirion*) DISCOLOR, *Lindl.*

E. discolor; rhizomate crasso elongato, caulibus crassissimis pedalibus clavatis profunde sulcatis, foliis oblongis lineari-oblongisve apice emarginatis coriaceis subplicato-nervosis, pedunculis dorso foliorum insertis iisque brevoribus crassis strictis fusco-tomentosis vaginis ovato-cordatis instructis apices versus floriferis, bracteis coriaceis ovato-cordatis, floribus breviter pedicellatis extus fusco-tomentosis intus flavis labello brunneo, sepalis oblongis obtusis, petalis angustioribus obovato-oblongis, labello basi columnæ apodæ articulato orbiculari dense tomentoso basi callo magno globoso nitido instructo. *Lindl. in Journ. Linn. Soc.* iii. 51. E. pulchella (*partim*), *Hook. f. Fl. Brit. Ind.* v. 802 (*planta Sikkimensis*) *et* vi. 190.

HAB.—SIKKIM HIMALAYA; alt. 3—4,000 ft., J. D. H.

Rhizome thicker than a swan's quill, woody, terete, naked. *Stems* distant on the rhizome, a foot high, of a few very large naked internodes 2—3 in. long by 1 in. diam., the basal narrowed, and a few short terminal ones, all dark-green, shining and deeply grooved, somewhat contracted at the nodes. *Leaves* 5—8 in. by 1—1½ in., suberect, with about 7—10 longitudinal grooves on the upper surface. *Peduncles* inserted at the backs of the leaves at their bases 3—4 in. long, as thick as a crow-quill, stiff, erect or spreading with several bract-like cordate brown sheaths ⅙ in. long, and many imbricating ones at its base; flowers ½ in. diam., crowded at the ends of the peduncle. *Sepals* and *petals* coriaceous. *Lip* inserted by a very short narrow claw, above which is a bead-like shining black callus. *Column* stout, incurved. *Anther* broadly conical.

This fine drawing shows me that I erred when describing the Erias for the Flora of British India, in uniting Lindley's *E. discolor* with the Malayan *E. pulchella*, a much smaller plant, to which, however, it is very closely allied. Both are referable to Blume's genus *Callostylis* (*C. rigida*, Blume, Bijdragen, 340, Fig. 74), afterwards altered to *Tylostylis* (Blume Fl. Jav. Praef. vi), that of *Callostylis* having been preoccupied. This genus *Tylostylis* is, though reduced to *Eria* by Lindley and others, I suspect a distinct one, remarkable for the spreading perianth, the total absence of a mentum, the lip articulate with the base of the column and mobile, and presenting a singular polished nob at its base. According to Griffith, *E. barbata*, Reichb. f. has a mobile lip, but of a very different form from that of *E. pulchella* and *E. discolor*, and its flowers are otherwise those of a true *Eria*. This character of a mobile lip can be satisfactorily ascertained only on living specimens. If the genus *Tylostylis* is to be retained, the Malayan *E. pulchella* should take the name of *T. rigida*, Bl., and the species here figured of *T. discolor*. The drawing gives no indication of locality, or other information than "Orchid sent by Mr. Jaffray, drawn 1880, G. King." According to the drawing the pollinia are very peculiar. I have not the means of verifying it.

Fig. 1, flower; 2, anther; 3, pollinia :—*enlarged.*

PLATE 33.

ACANTHEPHIPPIUM STRIATUM, *Lindl.*

A. striatum; pseudobulbis cylindraceis v. elongato-obpyriformibus, foliis obovato-oblongis acutis, floribus capitatim congestis, bracteis magnis lanceolatis acuminatis flores subæquantibus viridibus rubro-striatis deciduis, floribus albis roseo-striatis, sepalis lateralibus oblongis apice rotundatis, mento calcariforme incurvo obtuso, petalis sepalis æquilongis, labelli lobis lateralibus subquadratis antice rotundatis, postice falcato incurvis, terminali parvo coccineo, disco crista media nervisque 2 incrassatis instructo. *Lindl. in Bot. Reg.* 1838, *Misc.* 45; *Walp. Ann.* vi. 460; *Hook. f. Fl. Brit. Ind.* v. 816.

HAB.—SIKKIM HIMALAYA, *Griffiths' collector*; at Pacheem (*Ic. Herb. Hort. Bot. Calc.*). NEPAL (*Lindley in Bot. Reg.*).

Pseudobulbs 2—3 in. by 1—1¼ diam., green, quite smooth and terete, clothed above with long brown lacerate sheaths which embrace the leaf-bases; flowering stems 4—5 in., very stout, sometimes two together, green, clothed with green sheaths 2—2½ in. long with reddish tips, or sometimes with pale tips striated with red; bracts 1½ in., elongate-cymbiform; pedicel very short and stout, with the ovary about 1 in., green streaked with red; flowers 1½ in. from the tip of the dorsal sepal to that of the mentum.

Lateral sepals very broad; petals and lip concealed within the sepals; lip hardly longer than the column.

Described from the drawing, which probably exaggerates the dimensions of the specimen it portrays. The species was first described by Lindley in 1838 from living plants which were procured from Kew and said to have been received from Nepal (no doubt from Dr. Wallich). Lindley's description accords very well with the figure here reproduced, which is that of a Sikkim plant, which was collected at Pacheem, on the southward flanks of the outer Himalaya, at an elevation of about 5,000 feet.

The Indian species of *Acanthephippium* all want careful analyses and figures taken from living specimens; the texture of their flowers is such that in a dried state they cannot be satisfactorily studied.

Fig. 1, flower of the *natural size*; 2, ovary lip and column; 3, anther; 4 and 5 pollinia:—*all enlarged.*

PLATE 34.

Nephelaphyllum grandiflorum, *Hook f.*

N. grandiflorum; foliis longe petiolatis ovato-cordatis acuminatis, scapo foliis longiore pubescente vaginis pallidis cylindraceis elongatis, bracteis setaceis pedicello brevioribus, racemo laxifloro erecto, floribus 1 poll. diam. virescentibus roseo ornatis, sepalis lateralibus lanceolatis acutis, petalis latioribus ellipticis acutis, mento late conico apice rotundato, labello parvo oblongo decurvo, disco 3-carinato, lobis lateralibus brevibus obtusis, terminali ovato obtuso. *Hook. f. Fl. Brit. Ind.* vi. 192.

Hab.—Perak (*Ic. Scortechini*), *Kunstler.*

Stem short, terete, green, rooting. *Leaves* about 2, 4 by 2½ in., cordate, with a narrow deep sinus at the base, 7—9-nerved, bright green; petiole 3—4 in., terete, green, without a sheathing base, but sheathed with a long membranous deciduous vagina. *Scape* with raceme 10 in., green, finely pubescent, with two long membranous pale sheaths below the middle 1—1½ in. long; raceme 2—7-fld.; bracts ⅙ in., slender; pedicel with ovary ½—⅔ in.; flowers nodding, 1 in. diam, dull green, flushed with red, or the sepals with red margins. *Lateral sepals* ascending, subfalcate; mentum broad; petals as long, but rather broader. *Lip* with 3 keels on the disk from base to apex, white or pink with a dark red midlobe.

Much the largest species hitherto discovered. The drawing is inscribed "Malaya Fl. 28-4-82, H. B. C., Cult., recd. from Kunstler, Perak." A drawing by Scortechini represents the scape as 2-fld.

Fig. 1, flower with the lip removed; 2, do. with a lateral sepal removed, *both of the natural size*; 3, front and 4, side view of lip; 5, column; 6, anther; 7 pollinia:—*all enlarged.*

PLATE 35.

Tainia latifolia, *Benth.*

T. latifolia; caule procumbente radicante, foliis elliptico-lanceolatis acuminatis lamina petiolo longiore, scapo cum racemo laxifloro 2—3 pedale, bracteis lineari-lanceolatis ovario brevioribus, sepalis 3-nerviis petalisque 5-nerviis lineari-oblongis obtusis flavidis

fusco-purpureo striatis, mento brevi rotundato, labello obovato-oblongo aureo, lobis hypochilii lati antice acutis, disco 3-carinato carinis lateralibus medio incrassatis, epichilio parvo sinu hypochilii semi-immerso orbiculari v. obcordato, disco tenuiter 5-nervi, anthera 2-umbonata, latifolia. *T. Benth. in Herb. Kew.; Hook. f. Fl. Brit. Ind.* v. 820 *et* vi. 192. Ania latifolia, *Lindl. in Wall. Cat.* n. 3741 *et Gen. and Sp. Orchid* 130. Eria Ania, *Reichb. f. in Walp. Ann.* vi. 270.—Cymbidium, *Griff. Notul.* iii. 343, *et Ic. Pl. Asiat.* t. 319.

HAB.—SIKKIM HIMALAYA, alt. 8,000 ft. (*Ic. in Herb. Hort. Calcutta*). SILHET, CACHAR, and the KHASIA HILLS, *Wallich, &c.* UPPER BURMA, *Griffith.*

Stem prostrate or ascending, cylindric, not or hardly pseudobulbous, as thick as a goose-quill, green, smooth. *Leaves* solitary, erect, 6—12 by $1\frac{1}{2}$—$3\frac{1}{2}$ in., 5-nerved, dark green; petiole 3—4 in., enclosed for half its length or more in an appressed membranous brown sheath. *Scape* taller than the leaf, purplish, with two long, tubular, acute, brown sheaths; raceme laxly many-fld.; bracts $\frac{1}{3}$—$\frac{1}{2}$ in.; pedicel with ovary $\frac{2}{3}$ in.; flowers $\frac{2}{3}$ in. diam.; sepals and petals recurved. *Anther* with 2 dark bosses.

The leaves of the Sikkim specimen here depicted are narrower than usual in *T. latifolia*, and the habitat recorded on the drawing "Temperate oak woods on Sinchal, 8,000 feet above the sea, 31-8-62, T. Anderson," is far above that at which the species had previously been collected—much higher, indeed, than the genus, which is essentially tropical, had been known to attain. As in all orchids the determination of the lamellæ, keels, crests, &c., of the disk of the lip is exceedingly difficult in dried specimens, and that here given at figs. 1 and 2 from the Sikkim plant will not stand critical comparison with fig. 3, which is from a drawing of my own, or with Griffith's drawing of the Burmese plant on t. 319 of his "Icones." I am, however, satisfied that all belong to the same species.

Figs. 1 and 2, ovary, lip and column; 3, lip; 4, anther; 5, pollinia:—*all enlarged.*

PLATE 36.

TAINIA CORDIFOLIA, *Hook. f.*

T. cordifolia; caule foliifero violaceo pseudobulboso, folio amplo late ovato-cordato petiolo violaceo plureis longiore, scapo unacum racemo multifloro bipedali basi vaginato, bracteis ovario brevioribus lineari-lanceolatis, sepalis petalisque linearibus acutis viridibus rubro-marginatis, mento brevi, labelli aurei lobis lateralibus acutis, epichilio suborbiculari amplo, disco tricarinato, carinis hypochilio continuis epichilio ultra mediam evanescantibus, anthera 2-umbonata. *Hook. f. Fl. Brit. Ind.* vi. 193.

HAB.—SIKKIM HIMALAYA (*Ic. in Herb. Hort. Calcutta*). BHOTAN (*Ic. Simons in Herb. Hort., Calcutta*).

Stem as stout as the middle finger; pseudobulb of leaf 2 in., bottle-shaped, smooth, dark violet-blue, enclosed in a deciduous brown sheath. *Leaf* about 12 by $4\frac{1}{2}$ in., 7-nerved, base obliquely cordate, sinus open; petiole $2\frac{1}{2}$ in., very stout, violet-blue. *Scape* stout, base enclosed in long membranous brown sheaths, green; raceme 8—10 in., very many-fld.; bracts and short pedicels reddish; flowers $1\frac{1}{2}$ in. diam. *Sepals* and *petals* spreading.

Much the largest species of the genus, but of which I have seen no specimen, and have therefore to trust to the drawings for the entire description. Of these, that of Simons is a very rude outline in pen and ink, and without analyses; that here reproduced is inscribed "Introd. from Sikkim, Feb. 1867, fld. Feb. 1867, T. Anderson; fld. again March 1875, G. King."

Fig. 1, flower; 2 front view of do; 3 lip foreshortened; 4, anther; 5 pollinia:—*all enlarged.*

PLATE 37.

Phajus mishmensis, *Reichb. f.*

P. mishmensis; caule robusto elato folioso basi vix pseudobulboso, foliis alternis elliptico-lanceolatis acutis, scapo axillari elongato plurifloro, bracteis lanceolatis caducis ovario brevioribus, floribus suberectis roseis, sepalis petalisque lineari-oblongis subacutis concavis, labello sepalis aequilongo, lobis lateralibus brevibus rotundatis recurvis, terminali parvo orbiculari 2-lobulato integerrimo, disco cristato, calcare angusto sepalis dimidio breviore. *Reichb. f. in Bonplandia* v. 43 *et in Walp. Ann.* vi. 922, 928. *Hook. f. Fl. Brit. Ind.* v. 817. Limatodes mishmensis, *Lindl. and Paxt. Fl. Gard.* iii. 36.

Hab.—Sikkim Himalaya, in hot valleys, *Clarke.* Mishmi Hills, *Griffith.*

Stem 3—4 ft., as thick as the middle finger, somewhat tuberous at the very base; naked below, with the fibrous remains of old leaf-sheaths on the nodes, leafy above. *Leaves* 6—12 by 4—5 inches, 5-nerved. *Scapes* 1—2, rather slender, much exceeding the leaves, green; sheaths few, narrowly-lanceolate; racemes few and lax-fld.; bracts narrowly-lanceolate, much shorter than the ovary; pedicel with ovary slender, 1—1½ in., suberect. *Lateral sepals* 1¼ inches long, bright rose-coloured; petals narrower, paler; lip narrow with short everted lobes; spur green.

The drawing here reproduced is from the collection formed by the late J. F. Cathcart, Esq., B. C. S., when residing in Darjeeling in 1849, and now at Kew.

Fig. 1, side view of flower; 2, front view of same with sepals and petals removed and the lip spread out; 3, lip and column:—*all of the natural size*; 4, anther; 5?; 6, pollinia:—*all enlarged*; 7, young fruit of the *natural size*; 8, transverse section of the same, *enlarged.*

PLATE 38.

Cœlogyne Kingii, *Hook. f.*

C. Kingii; rhizomate robusto ascendente crebre articulato fibroso, pseudobulbis diphyllis magnis anguste ovoideis sulcatis diphyllis, foliis magnis lanceolatis acuminatis, scapo aphyllo rhizomate inserto stricto elongato toto vaginato, vaginis inferioribus brevibus arcte imbricatis superioribus elongatis laxioribus, racemo ascendente laxifloro, bracteis pollicaribus ovario excedentibus lineari-cymbiformibus, floribus albis 1½—2 poll. latis, sepalis lateralibus lanceolatis acuminatis dorsali elliptico-lanceolato, petalis oblanceolatis acutis, labelli lobis lateralibus brevibus rotundatis, terminali orbiculari, disco cristis 5 medio lobi terminalis evanidis percurso.

Hab.—Perak, *Kunstler.*

Rhizome as thick as a swan's quill, with many internodes ½ in. long, fringed with fibres at the nodes, and emitting short rootlets, probably erect and inclined against

the trunks of trees. *Pseudobulbs* $3\frac{1}{2}$ inches long by $1-1\frac{1}{4}$ inches diam., pale green, with many longitudinal furrows. *Scape* inserted on the rhizome near the base of a pseudobulb, 6 inches long, striate, erecto-patent, clothed throughout with coriaceous sheaths, the lower of which are very short and closely imbricate, the upper laxer, an inch long, tubular with obtuse mouths. *Raceme* 4 inches long, ascending, 6-fld.; rachis slender, subflexuous; bracts rigid, one inch long, elongate-cymbiform, subacute, rather longer than the ovary; pedicel slender; flowers pure white except the five yellow crested ridges on the lip, which extend from the base to halfway down the terminal lobe. *Sepals* 1 inch long and petals pure white, lateral lanceolate acuminate, dorsal elliptic acute; petals as long, oblanceolate, acute. *Lip* with obtuse short side-lobes and an orbicular apiculate midlobe. *Column* truncate at the top.

Though in most characters a member of a section of *Eucœlogyniœ* which flower from an undeveloped pseudobulb, and of which the scapes are clothed with imbricating sheaths, it would, if the drawing is to be depended upon, differ from all those known to me in the scape springing directly from the rhizome, and neither from the base or apex of an old or nascent pseudobulb. Be this as it may, *C. Kingii* is a very different species from any Indian one known to me. Its nearest allies are *C. Maingayi*, Hook f., and the following (*C. longibracteata*).

The drawing here reproduced is inscribed "Perak, Kunstler, fld. in H. B. C., 21-5-86." Fig. 4 is drawn from a dried lip, by Miss Smith at Kew.

Fig. 1, flower; 2, the same with the sepals and petals detached, and lip removed; 3, column and lip; 4, lip; 5 and 6, anther; 7, pollinia:—all of the *natural size*.

PLATE 39.

Cœlogyne longibracteata, *Hook. f.*

C. longibracteata; rhizomate elongato erecto?, pseudobulbis ovoideis sulcatis, foliis petiolatis elongato-lanceolatis acuminatis 3-nerviis, scapo elongato striato erecto-patente paucifloro fere ad apicem vaginato, vaginis basi paucis brevibus caeteris valde elongatis tubulosis, suprema racemum foliaque 2-emittente, racemo stricto erecto, bracteis longissimis $2\frac{1}{2}-3$ pollicaribus lineari-lanceolatis acuminatis strictis deciduis, floribus albis $2\frac{1}{2}$ poll. diam., sepalis lanceolatis acuminatis, petalis lineari-oblanceolatis acutis, labelli albi lobis lateralibus brevibus rotundatis, terminali orbiculari, disco cristis 5 aureis medio evanidis percurso.

Hab.—Perak, *Kunstler.*

Rhizome rather stout, probably erect or inclined against the trunks of trees. *Pseudobulbs* ovoid, green, many-furrowed, $1\frac{1}{2}-2$ in. long. *Leaves* 6—7 by $1-1\frac{1}{2}$ in., pale-green, 3-nerved; petiole 1 in. *Scape* 6 in., striate, suberect, clothed for the greater part with green sheaths, of which the lower few are short and looser, the rest very long and tubular; a pair of erect young leaves, longer than the raceme, protrude with the latter from the uppermost sheath; raceme 3 in., erect, strict, 3—5-fld.; bracts very long, slender, striate, concave, at length deflexed; pedicel with ovary 1 in., decurved; flowers deflexed, white, fragrant. *Sepals* lanceolate, acuminate; petals oblanceolate, acute; lip with the midlobe as long as the hypochil, nearly orbicular, its margins crisped towards the base; lobes of hypochil rounded; disk with five golden-crested ridges running from the base to the middle of the midlobe.

A species remarkable for the great length of the bracts, which far exceed those of any other Indian species known to me. It belongs to the same section as *C. Maingayi* and *C. Kingii*, but differs from both in the two long leaves the petioles of which are embraced in the same sheaths as the scape. In the Flora of British India the pseudobulbs are by error described as obovoid instead of ovoid.

The drawing is inscribed "Kunstler, Perak, in H.B.C., introd. 4-5-83, fld. 1-9-83, G. King."

Fig. 1, flower of *natural size*; 2, lip *enlarged* by Miss Smith from a flower which accompanied the drawing.

PLATE 40.

Cœlogyne (*Eucœlogyne*) suaveolens, *Hook. f.*

C. suaveolens; rhizomate robusto repente squamis ovatis acutis arcte imbricatis tecto, pseudobulbis magnis remotis elongato-obfusiformibus ovoideisve, foliis magnis sessilibus v. petiolatis elliptico-lanceolatis acuminatis 5-nerviis marginibus undulatis, scapo ascendente toto vaginato, vaginis viridibus coriaceis inferioribus distichis ovatis acuminatis arcte imbricatis superioribus longioribus, supremo foliaceo, racemo multifloro nutante rachi sub-articulato, bracteis spathaceis caducis, floribus distichis albis, sepalis erectis oblongo-lanceolatis acutis, petalis obovato-oblongis, labelli hypochilio angusto lobis rotundatis, epichilio dilatato late ovato *v.* orbiculare, disco cristis 4 v. 6 aureis percurso. *Hook. f. Fl. Brit. Ind.* v. 832. C. undulata, *Wall. mss.* Pholidota suaveolens, *Lindl. in. Gard. Chron.* 1836, 372.

Hab.—Khasia Hills. Sikkim, at Mungpo, alt. 1,500 ft., *Clarke.* Assam (*Ic. in. Herb. Hort., Calcutta*).

Rhizome as stout as a goose-quill, creeping, clothed with closely imbricating appressed ovate acute distichous brown scales $\frac{1}{2}$ in. long. *Pseudobulbs* 2—3 in. long, usually narrowly ovoid, with a few very slender ribs. *Scape* ascending, densely clothed with distichous sheaths, the lower of which resemble those of the rhizome, but are green, the upper gradually longer and more lax, the uppermost foliaceous closely embracing the young emerging leaves; raceme 4—6 in., inclined or drooping, many-fld.; bracts distichous, coriaceous, striate, cymbiform, as long as the rachis, articulate; pedicel with ovary $\frac{1}{2}$ in., curved sigmoidly; flowers white, $\frac{1}{2}$—$\frac{3}{4}$ in. long, very fragrant. *Sepals* and *petals* erect. concave, subequal, pure white. *Lip* as long as the sepals, white with golden ridges on the disk. *Column* short for the genus.

An interesting species, as showing a strong affinity with *Pholidota* in habit, in the closed distichous flowers and sub-articulate rachis of the raceme, and in the column being shorter than in the typical Cœlogynes; but the large flowers, and form of the lip, which is not saccate, and the far longer column than that of any *Pholidota*, and which is neither hooded nor winged, effectually exclude it from the latter genus.

The drawing is marked "Assam, 20-4-80, G. King."

Fig. 1, bract; flower with sepals and petals detached; 3, lip; 4, side view of ovary and column; 5, the same view in front and 6, from behind; 7, column; 8, anther; 9, pollinia:—*all enlarged.*

PLATE 41.

Cœlogyne (*Eucœlogyne*) ovalis, *Lindl.*

C. ovalis; rhizomate repente ramoso vaginato, pseudobulbis oblongis obtusis, foliis elliptico-lanceolatis acutis 5-nerviis, scapo ex apice pseudobulbi foliis breviore basi vaginato 1—3-floro, bractea magna spathacea caduca, sepalis lateralibus ovato-lanceolatis acutis pallide brunneis, dorsali oblongo, petalis augustissime linearibus filiformibusve, labello flavo v. albo atro-purpureo vittato et venoso laxe longe fimbriato et piloso, lobis lateralibus rotundatis v. subacutis, terminali late ovato, disco lamellis 2 nervisque validis percurso. *Lindl. in Bot. Reg.* 1838 *Misc.* 91 *et Fol. Orchid.* 12; *Walp. Ann.* vi. 232. *Hook. f. Fl. Brit. Ind.* v. 836. C. fimbriata, *Lindl. in Wall. Cat. n.* 1957; *Griff. Notul.* iii. 281, et *Ic. Pl. Asiat.* 291. f. i. ? C. pilosissima, *Planch. Hort. Donat.* 104. Broughtonia linearis, *Wall. mss.*

Hab.—Temperate Himalaya; from Kumaon eastwards, alt. 4—7,000 ft. Khasia Hills, alt. 4,000 ft.. Munnipore (a large leaved var.), alt. 4,000 ft., *Clarke.*

Rhizome as thick as a goose-quill or less, closely annulate. *Pseudobulbs* 2—3 in., flattened, with a large ovate brown basal sheath. *Leaves* 3—4 in., hardly petioled. *Scape* 1—2 in. flexuous, usually 1-fld.; bracts elongate, acuminate, coriaceous; pedicel with ovary, $\frac{1}{2}$ in.; flowers very variable in size. *Sepals* $\frac{1}{2}$—1 in., yellowish-brown, lateral ovate-lanceolate, acuminate, dorsal oblong; petals 1-nerved, extremely narrow, strongly falcately recurved usually backwards on each side of the dorsal sepal; lip with a yellow-brown hypochil and large orbicular-ovate epichil, copiously fringed and covered on the surface with flexuous purple hairs, disk of epichil with a slender median and two broad dark purple stripes that meet at the apex, and two ridges or lamellæ, one on each side of the median stripe; very many purple nerves run from the broad outer stripes to the margin. *Column* long, tip rounded. *Capsule* 1 in., turgidly pyriform.

A very variable plant in size, though I have seen no specimen approaching in this respect that here figured, the drawing of which is inscribed "Sikkim, 4—6,000 ft. October 1876. G. K." But for the greater size, this is hardly if at all distinguishable from *C. fimbriata*, Lindl,—a Khasia species also found in China, of which the rhizome is no thicker than a duck's quill, and the pseudobulbs $\frac{3}{4}$—$1\frac{1}{2}$ in. long and ovoid-oblong. Indeed unless better characters are found on a comparison of living specimens to distinguish these two plants, I think they must be united under the name of *C. fimbriata*, Lindl., in Wall. Cat. n. 1957. Both species were established by Lindley and described contemporaneously in 1838, *C. fimbriata* at Tab 868 of the Botanical Register, and *C. ovalis* in the Miscellanea of the same year and volume. *C. fuliginosa*, Lindl., of Tenasserim (Bot. Mag. 4440), is another far too closely allied plant.

Fig. 1, Dorsal sepal; 2, lateral sepal; 3, petals; 4, lip; 5, column; 6, anther; 7, pollinia:—*all enlarged.*

PLATE 42.

Cœlogyne (*Eucœlogyne*) flavida, *Wall. mss.*

C. flavida; rhizomate elongato squamis brevibus ovatis acutis arcte imbricatis et appressis vaginato, pseudobulbis ovoideis v. oblongo-ovoideis sulcatis, foliis longe petiolatis lineari-lanceolatis acuminatis multinerviis, scapo pseudobulbo terminali gracili foliis

breviore apicem versus vaginis parvis oblongis distichis coriaceis brunneis arcte imbricatis tecto, racemo brevi erecto, bracteis spathaceis ovario longioribus deciduis, floribus parvis stramineis, sepalis oblongis acutis, petalis anguste linearibus obtusis, labelli lobis lateralibus rotundatis terminali majusculo recurvo cuneatim obcordato, disco tenuiter 2-carinato. C. flavida, *Wall. mss.*; *Hook. f. Fl. Brit. Ind.* v. 839; *Lindl. Fol. Orchid., Cœlog.* 10 (*excl.* "*Auct. Hook. f.*"); *Walp. Ann.* vi. 223.

HAB.—NEPAL, *Hamilton.* SIKKIM, alt. 1—4,000 ft. KHASIA HILLS, alt. 4—5,000 ft. *Lobb.*, *&c.* MUNNIPORE, on Kohima, *Prain.*

Rhizome as thick as a goose-quill or less, as it were zigzagged superficially by the imbricating triangular brown scales. *Pseudobulbs* 1—2½ in., distant on the rhizome. *Leaves* 3—6 in., bright green; petiole slender, 1—1½ in. *Scape* 6—10 in., slender, green, naked up to about one inch below the raceme, where it is clothed with small distichous closely imbricating convex glumaceous light-brown scale-like sheaths about ⅙ in. long; raceme 1—1½ in., erect, rather close-fld.; bracts sub-distichous, narrowly oblong, concave, about ⅓ in. long or less, deciduous; pedicel with ovary ½ in.; flowers ½ in. diam., uniformly pale yellow. *Sepals* oblong, acute; petals narrowly linear; lip with small side lobes and a large obcordate midlobe, disk with 2 faint ridges. *Capsule* ⅔ in. long, ellipsoid.

C. flavida belongs to a group of nine Indian species of the genus, with terminal scapes that bear distichous imbricating scales immediately below the raceme, which is otherwise naked. It would be interesting to discover the object of this singular arrangement. The said scales may be regarded as greatly reduced empty floral bracts like the small flowerless glumes beneath the principal flowerless ones in some grasses, but this is no explanation. A very curious modification of the scape is represented at fig. B., which is taken from a specimen in the Wallichian Herbarium, marked in Wallich's handwriting as received from Mr. Hamilton in Nepal. It presents a scape terminated by an elongate rachis which bears three superposed series of distichous persistent imbricating flowerless bracts, separated by flowering intervals when the rachis is zigzag, and naked from the flowering bracts having fallen away. The third or uppermost series of flowerless bracts is succeeded by a continuation of the rachis with its flowering bracts and flowers. Of the three naked intervals, the lowest has neither flower nor fruit, the second bears fruit, the third or terminal is flowering. This arrangement indicates three successive superposed inflorescences on the same scape, probably occupying as many years for their development. I know of no parallel to this in the genus, though such may very well occur. The drawing here reproduced is of a Khasia specimen and is inscribed "*C. flavida*, Wall. Mr. Gibson, Cherra."

Fig. 1, bract and flower; 2 ovary and column; 3, dorsal and 4, lateral sepals; 5, petals; 6, lip; 7, anther; 8 pollinia:—*all enlarged.*

PLATE 43.

CŒLOGYNE ? UNIFLORA, *Lindl.*

C. ? uniflora, pseudobulbis rhizomate squamoso confertis parvis lagæniformibus diphyllis squamis distichis membranaceis vaginatis, foliis lineari-lanceolatis acuminatis, scapo e basi pseudobulbi brevissimo 1—2 floro, bracteis parvulis pedicello decurvo brevioribus, floribus flavis, sepalis lateralibus oblongo-lanceolatis acuminatis recurvis, dorsali erecto, petalis angustioribus elliptico-lanceolatis acuminatis, labelli a basi subsaccato patente, lobis lateralibus fere basilaribus auriculæformibus patentibus (columnam non amplectantibus) terminali obovato-orbiculari v. subpanduriforme, disco carinato. *Lindl. in Wall. Cat.*

n. 1966 *et Gen. and Sp. Orchid* 42; *Hook. f. Fl. Brit. Ind.*, v. 842. Panisea uniflora, *Lindl. Fol. Orchid.* Panisea 2; *Walp. Ann.* vi. 240.—Epidendrum, *Griff. Ic. Pl. Asiat.* t. 313 f. 1.

HAB.—TROPICAL HIMALAYA; Nepal, *Wallich*; Sikkim, alt. 3,500 ft., J. D. H. KHASIA HILLS? *Griffith.* TENASSERIM; at Moulmein, *Parish.*

Rhizome densely matted, clothed with imbricating distichous ovate scales. *Pseudobulbs* $\frac{1}{2}-\frac{3}{4}$ in., broadly or narrowly bottle-shaped, with dark brown large basal sheaths. *Leaves* 3—6 by $\frac{1}{3}$ in. or less, dark green. *Scape* shorter than the pseudobulb; ovary with pedicel $\frac{1}{2}$ inch, decurved; flower pale yellow with orange spots on the lip, about ·1 in. from the tip of the dorsal sepal to that of the lip. *Lateral sepals* oblong-lanceolate, acute, deflexed and recurved; petals suberect; lip spreading from the base of the column, with two ear-shaped sidelobes towards the saccate? base, and a large broadly obovate or subpanduriform midlobe, disk with thickened ridges. *Column* winged; the wings rather dilated above the middle.

A very doubtful *Cœlogyne*, differing from its congeners apparently in the lip not embracing the column, for which reason it has been referred to *Panisea* by Lindley; but the lip wants the claw of that genus, and the form of the flower is much more that of a *Cœlogyne*. The drawing does not represent the three orange spots described by Wallich (according to Lindley). There are indications in figs. 1 and 3 of two small tubercles at the base of the lip. In the Flora of British India the scapes instead of the pseudobulbs are by misprint described as clothed with membranous sheaths. The drawing is inscribed "C. falcata, T. Anders. mss., introd. from Darjeeling; again in April 1876, G. King."

Fig. 1, flower with perianth segments detached; 2, lip; 3 and 4, anther; 5 and 6, pollinia:—*all enlarged.*

PLATE 44.

CALANTHE HERBACEA, *Lindl.*

C. herbacea; elata, rhizomate repente, caule robusto, foliis elliptico-ovatis v. lanceolatis acuminatis, scapo axillari robusto, racemo multifloro, bracteis $\frac{3}{4}$ poll. longis oblongo-lanceolatis acutis, sepalis oblongis oblanceolatisve petalisque angustioribus virescentibus v. supra medium aurantiacis, labello albo columnæ adnato, lobis lateralibus angustis falcatis terminali fere 2-partito segmentis lineari-oblongis falcatis divaricatis, calcare gracili sepalis duplo v. triplo longiore. *Lindl. Fol. Orchid*, Calanthe, 10; *Hook. f. Fl. Brit. Ind.* v. 852.

HAB.—SIKKIM HIMALAYA, alt. 4—6,000 feet, *J. D. H.*, *King.*

Stem with the strongly ribbed leaf-sheaths, as thick as the middle finger. *Leaves* 3—4, 8—10 by 2—3 in., elliptic or ovate-lanceolate, acuminate, 5-nerved and strongly 5-ribbed on the back. *Scape* from among the lower leaves, at the side of the stem, a foot and more high, stout, green, with one or two green sheaths; raceme 6—10 in., laxly many-fld.; bracts sheathing, more or less persistent, green; pedicel with ovary 1 in.; flowers 1—1$\frac{1}{2}$ in. broad across the sepals. *Sepals* and *petals* all green or ochreous yellow for the upper half; sepals variable in width, sometimes obovate and apiculate; petals about half as broad; lip adnate by the spur to the large long column,

broader than long, pure white, subequally 4-partite, the divaricating recurved obtuse segments of the midlobe being very little broader than the similarly divaricating recurved sidelobes; spur very long and slender; a minute caruneulate 2-lobed callus is placed at the very base of the lip close to the mouth of the spur.

A very handsome plant. The flowers are all green, except the lip in a drawing I made of it in Sikkim, and I did not observe the remarkable rhizome, which in plate 44 is represented as stout, horizontal, densely fibrous, and bearing a series of closely set conical green pseudobulbs, each with six or seven horizontal constrictions, and a small terminal tubercle, and emitting thick vermiform roots from the joints. If these are short stems of previous year's growth denuded of sheaths and leaves, they must increase very greatly after their denudation, for they diminish in size as they approach the flowering and leafing stem which terminates the rhizome.

Fig. 1, flower; 2, ditto, with the sepals and petals detached and lip removed; 3, lip with the spur removed; 4, top of column ?; 5 and 6, anther; 7 and 8, pollinia :—*all enlarged.*

PLATE 45.

CALANTHE CHLOROLEUCA, *Lindl.*

C. chloroleuca; rhizomate robusto repente, caule robusto foliis (sub-anthesin immaturis) elongatis petiolatis elliptico-lanceolatis, scapo elongato, bracteis parvis persistentibus, sepalis ovato-lanceolatis acuminatis petalisque lanceolatis viridi-flavidis, labello columnæ adnato albo basi aureo, lobis lateralibus oblongis rotundatisve, terminali late obcordato v. orbiculari 2-lobo, calcare cylindraceo sepalis subæquilongo. *Lindl. Fol. Orchid.* Calanthe, 10; *Walp. Ann.* vi. 920; *Hook. f. Fl. Brit. Ind.* v. 852. C. galeata, *Lindl. l. c.*, *Walp. l. c.*

HAB.—SIKKIM HIMALAYA; alt. 6—8,000 ft., J. D. H., *Treutler.*

Rhizome stout, fleshy, creeping, as thick as the little finger, with tuberous pseudobulbs on the upper surface and stout vermiform roots from the lower, stem as stout as the little finger. *Leaves* few, very young at flowering time, when mature a foot long, long-petioled, oblong-lanceolate, strongly nerved. *Scape* 6—10 in. high or less, raceme lax-fld. bracts $\frac{1}{4}$ in., ovate-lanceolate, green, not equalling the ovary; pedicels with ovary $\frac{1}{2}$—$\frac{3}{4}$ in. *Sepals* $\frac{2}{3}$ in. long, ovate-lanceolate, yellow-green, sometimes streaked with red; petals 3-nerved, usually more yellow than the sepals, lanceolate; lip white, yellow towards the base, sidelobes sometimes incumbent on the midlobe; spur straight, green, hardly longer than lateral sepals, glabrous or puberulous. *Capsule* $1\frac{1}{2}$ in. long.

Lindley founded *C. chloroleuca* on specimens of my own collected in Sikkim in 1848, aided by the figure which I here reproduce. It differs from *C. herbacea* (Tab. 44, also founded on Sikkim specimens of mine) in the form of the lip, much shorter spur, colour of the flowers, and in the leaves of this not being fully developed at the flowering time. Lindley further described, also from a drawing of mine, as *C. galeata*, what I believe to be a faded specimen of *C. chloroleuca* with sepals connivent, thus giving a hooded appearance to the flower. The Himalaya species of *Calanthe* are, however, very little known, and much more numerous specimens of *C. chloroleuca* and *C. herbacea* are wanted, together with better drawings than those here given of the nature of the rhizome, which in both species especially wants elucidation.

Fig. 1, side, and 2, front view of flower —*enlarged.*

PLATE 46.

EULOPHIA EXPLANATA, *Lindl.*

E. explanata; scapo aphyllo, bracteis subulatis ovario brevioribus, sepalis ovato-oblongis acutis basi labelli breviter adnatis, petalis latioribus ellipticis acutis 5-nerviis, labello oblongo v. subpanduriformi basi saccato apice truncato emarginato v. 2-lobo carinis 3 crassis carunculatis percurso. *Lindl. Gen. and Sp. Orchid.* 180; *Hook. f. Fl. Brit. Ind.* vi. 3 *et in Hook. Ic. Plant. t.* 1882. Dipodium scariosum, *Herb. Ham.*

HAB.—NEPAL; at Maghæla, in the Morung, *Hamilton.* N.-W. INDIA, *Falconer* (*Ic. in Herb. Hort. Calcutta*).

Leaves not fully developed at flowering time, afterwards 4—6 in. long, oblong-ovate, acuminate, plicate. *Scape* 4—8 in., rather stout, 4—10-fld., sheathed at the base; bracts $\frac{1}{3}$—$\frac{1}{2}$ in., appressed to the pedicel, which with the ovary is about $\frac{2}{3}$ in. and spreading; flowers nearly 1 in. diam. *Sepals* and *petals* widely spreading or recurved, pale purplish-brown with a broad pale central band and base; lip as long as the sepals, basal part or hypochil with a broad conical obtuse sac and short broad auricles; epichil spreading, golden yellow with the sides transversely barred with short recurved red nerves. *Column* short, stout. *Pollinia* globose, strap short, gland small orbicular.

A very interesting plant, only known for many years by a solitary specimen in Lindley's Herbarium, labelled as a native of Ceylon, where it was unknown to all Cingalese botanists and collectors. On examining the Orchideæ of Buchanan-Hamilton's Herbarium, now at the Edinburgh Botanic Garden, and kindly lent to me when preparing the Orchideæ for the Flora of British India, I found a specimen of a *Eulophia* so precisely the counterpart of that in Lindley's Herbarium of *E. explanata* as to leave no doubt that (as in a good many other cases) Lindley's habitat was an error; and I consequently figured it in the "Icones Plantarum" (1882) as a Nepal plant. I now find the excellent figure here reproduced of the same species in the Calcutta Herbarium collection of drawings, which confirms the Nepal habitat, and enables me to give the colour of the flowers. As a species *E. explanata* is perhaps nearest to *E. bracteosa*, Lindl. (including *E. grandiflora*, Lindl.), a native of the Khasia Hills, Chittagong, etc., and to which Lindley has also assigned the erroneous habitat of Ceylon; it differs from that plant in the short bracts, the sepals not rounded at the tip, and in the petals and lip being by no means obovate. The Calcutta drawing here reproduced bears the inscription "? Ania, Nepal (date and origin uncertain)." It represents a much larger specimen than Hamilton's.

Fig. 1, flower with the sepals and petals detached; 2, anther; 3 and 4, pollinia:—*all enlarged.*

PLATES 47, 48, 49, 50.

EULOPHIA (*Cyrtopera*) NUDA, *Lindl.*

E. nuda; elata, robusta, rhizomate tuberoso crasso, scapo aphyllo paucivaginato, racemo laxifloro, floribus magnis suberectis, perianthii foliolis conniventibus falcatis v. apicibus recurvis, sepalis lineari-oblongis lanceolatisve acutis v. acuminatis, petalis brevioribus oblongo-ovatis obtusioribus, labello erecto hypochilio basi saccato, sacco conico incurvo obtuso v. subrotundato, lobis lateralibus rotundatis, epichilio rotundato v. late spathulato retuso v. breviter bilobo marginibus crispato-crenatis, disco nervis crenulatis plus minusve cristato, anthera late conica latiore quam longa apice 3-loba, polliniis oblongis divaricatis caudicula brevi lata, glandula transversa. *Lindl. in*

Wall. Cat. n. 7371 *et Gen. and Sp. Orchid* 180; *Hook. f. Fl. Brit. Ind.* vi. 6. E. fusca, *Blume Orchid. Archip. Ind.* 182 *in nota.* E. bicolor, *Dalz. in Hook. Kew Journ. Bot.* iii. (1857) 343; *Dalz. and Gibs. Bomb. Fl.* 264. Cyrtopera fusca, *Wight Ic. t.* 1690; *Lindl. in. Journ. Linn. Soc.* iii. 31; *Thwaites Enum. Pl. Zeyl.* 429. C. plicata, *Lindl. in. Wall. Cat. n.* 7362 *et Gen. and Sp. Orchid,* 290. C. nuda, *Reichb. f. in Flora,* 1872, 374. C. Gardneri, *Thwaites l. c.* 302. C. mysorensis, *Lindl. in Journ. Linn. Soc.* iii. 32. C. laxiflora, *Gardn. mss.*. Dipodium Roniayte and plicatum, *Herb. Ham.*—? *Rheede Hort. Mal.* xii. *t.* 26.

HAB.—TROPICAL HIMALAYA, from Nepal eastwards. ASSAM, MUNNIPORE, PEGU, TENASSERIM, and UPPER BURMA; the DECCAN PENINSULA, from the Concan southwards; CEYLON, in the Central Province.

Tuber large, often 3 in. diameter, marked with transverse ridges, which bear the red fibrous remains of old leaf-sheaths; roots large long, vermiform, from all parts of the tubers. *Leafing-stem* 6—10 in. sheathed and ridged, bearing several lanceolate acuminate plicate leaves 4—6 in. long or more, not fully developed till after flowering. *Flowering stem* or scape leafless, 2—3 ft. high, as thick as a goose's or swan's quill, sheathed towards the base. *Raceme* loosely 6—10-fld., erect; bracts variable in length, short in var. *macrantha*; pedicel with ovary ascending, $\frac{2}{3}$—1 in. long. *Flowers* 1—$1\frac{1}{4}$ in. long, curved; lateral sepals inserted on the sac of the lip, which is rather shorter than the sepals, and like them ascending or erect at the base with a broad explanate recurved epichile.

When studying the Orchideæ from the Flora of British India, I had examined a great many specimens of this noble species under different names from various parts of India, without being able to separate any one as a distinct species, or to group them all under well-defined varieties (the latter a very dangerous process with dried specimens of Orchidæ). This was previous to my receiving the loan of the Calcutta collection of orchid drawings, wherein I find a splendid series of coloured portraits of Eulophias which not only come under the definition of *E. nuda*, but which differ so much in habit and colour of flowers that I cannot help suspecting that they may include more than one species. I have therefore considered it best to reproduce the most divergent forms that are represented in the aforesaid collection, and leave it to more extended observation to discover whether any or all of them should rank as species. They are—

PLATE 47. This appears to me to agree most closely with Lindley's *E. nuda* from Nepal; it is of medium size, with green sepals and petals suffused with dull purple towards their bases, as is the sac of the lip, which (the lip) is not longer than the sepals. It is inscribed "Darjeeling, May 1862, T. *Anderson*; Fld. in H. B. G., April 1875, G. King; introduced from Sikkim."

PLATE 48, var. *macrantha*, is a very tall stout plant, with much shorter bracts, the pedicel and flowers not so erect, the sepals and petals broader, pale green; the lip is white and much larger than the sepals. It is inscribed "Phajus ? Darjeeling."

PLATE 49, var. *purpurea*, is also a tall plant, with the rather spreading pedicels of var. *macrantha*, but it has the long bracts of the other vars.; the flowers are very large, the sepals narrow and dull purple, the petals much broader, rose pink streaked with darker pink, and the red-purple lip is hardly longer then the sepals. It is inscribed "Sikkim No. 3, 1-10-67 drawn, 18-5-70."

PLATE 50, var. *Andersoni*, is apparently a smaller form, but evidently in a young state; the bracts are large, the pedicel and ovary upcurved as in Plate 47, and flowers nearly erect, the sepals broad of a deep purple and green, the petals narrow and pinkish purple as is the lip which is not longer than the sepals. It is inscribed "Cyrtopera purpurea, T. Anders., mss. var., drawing made from wild specimen, Darjeeling, May 1862.—fld. in H. B. C. May 1867 from Darjeeling—T. A." Probably plate 50 represents the "fld. H. B. C. May 1867."

It will be observed that *E. nuda* differs much from the typical Indian Eulophias, whether of the section *Eulophia* proper, or *Cyrtopera*, in the erect segments of the perianth—a character it shares with *E. macrobulbon.*

PLATE 47. Fig. 1, Ovary lip and column; 2 and 3, anther; 4 and 5, pollinia:—*all enlarged.*

PLATE 48. Fig. 1, anther; 2, pollinia:—*both enlarged.*

PLATE 49. Fig. 1, flower with one lateral sepal and petal removed; 2, dorsal sepal; 3, lateral sepal; 4, anther; 5, pollinia:—*all enlarged.*

PLATE 50. Fig. 1, ovary column and lip; 2, 3, and 4, anther; 5, 6, pollinia:—*all enlarged.*

PLATE 51.

EULOPHIA (*Cyrtopera*) MACROBULBON, *Hook.*

E. macrobulbon; robusta, rhizomate crasso tuberoso, scapo bracteis paucis vacuis instructo, racemo dense multifloro, bracteis filiformibus ovaria sub-æquantibus, floribus sub-erectis, perianthii segmentis erectis, sepalis lineari-oblongis acutis rectis luride purpureis, petalis brevioribus pallidioribus ellipticis obtusis v. subacutis multinerviis, labelli concoloris hypochilio erecto oblongo in saccum conicum basi producto, lobis lateralibus brevibus, epichilio brevi ovato-rotundato recurvo, disco 3-nervi nervis basi incrassatis intermedio apicem versus crenato. *Hook. f. Fl. Brit. Ind.* vi. 7. Cyrtopera macrobulbon, *Parish and Reichb. f. in Trans. Linn. Soc.* xxx. 144.

HAB.—SIKKIM HIMALAYA (*Ic. in Herb. Calcutta*). TENASSERIM; at Moulmein, *Parish.*

Tuber apparently about the size of a small potato. Leafing *stem* as thick as the middle finger, with loose basal sheaths. *Leaves* 8—12 in. long, elliptic-obovate, apiculate, yellow-green above with dull purplish margins and strongly plaited, dull pale purplish red beneath with green nerves. *Scape* 18 in. long, as thick as the little finger or less, more or less purple; basal sheaths loose; raceme a span to a foot and a half long, erect; bracts $\frac{1}{2}$ in. long and slender pedicels and sepals dull violet purple. *Sepals* $\frac{1}{2}$—$\frac{2}{3}$ in. long; tips not recurved. *Petals* paler, shorter. *Lip* shorter than the sepals. *Column* short, anther depressed, umbonate; pollinia globose, caudicle short; gland small, orbicular.

E. macrobulbon differs a good deal from most or all the hitherto described species in the erect sepals not recurved at the tips. The Herbarium materials from which it was first described (from Moulmein) would appear to present some differences from that represented in the plate, especially in the lip, which in a dried state presents three very distinct thickened nerves, that are not here represented. The original drawing is inscribed "Eulophia fusca, *Wall.*," probably intended for *E. fusca*, Blume, which is *E. nuda*, Lindl.

Fig. 1, flower-bud; 2, side, and 3, back view of flower; 4, flower pedicel and bract, with the sepals and petals displayed; 5, ovary and column; 6, anther; 7 pollinia:—*all enlarged.*

PLATE 52.

EULOPHIA (*Cyrtopera*) ANDAMANENSIS, *Reichb. f.*

E. andamanensis; caule robusto basi tuberoso, foliis maturis lineari-lanceolatis, scapo bracteis paucis lanceolatis instructo, racemo laxe paucifloro, bracteis ovario multo brevioribus, floribus patentibus, perianthio explanato virescente, sepalis lateralibus petalisque lineari-lanceolatis acutis v. acuminatis patenti-recurvis falcatisque, dorsali erecto, labelli

hypochilio brevi 2-auriculato base in cornu brevem incurvum producto, epichilio late unguiculato orbiculari marginibus crispatis viridibus, disci albi nervis 3 in hypochilio incrassatis, nervulis epichilii divaricatis ramosis. *Reichb. f. in Flora*, 1872, 276; *Hook. f. Fl. Brit. Ind.* vi. 8.

HAB.—TENASSERIM; at Moulmein, *Parish.* ANDAMAN ISDS., *Kurz.*

Tuber not seen. *Leafing* stem very short, with the broad sheathing bases of the leaves 2 in. diam. *Leaves* very small at flowering time, when mature a foot or more long, dark green, paler beneath. *Scape* 1—2 feet, rather slender, green. *Raceme* short; flowers spreading, 1—1¼ in. diam.; bracts, sepals petals and ovary green. *Sepals* ⅔ in. long, 3—5 nerved; petals rather shorter and broader, 3-nerved. *Lip* recurved, shorter than the petals, very conspicuous from the white disk, broad green crisped margins, and transverse red veins of the epichil. *Anther-tip* bifid; pollinia globose, very broad, caudicle quadrate.

Herbarium specimens resemble a good deal *E. virens*, from which this differs in the very distinct prolongation of the foot of the column, and which brings it into the group *Cyrtopera*.

The drawing is inscribed "Eulophia sp., introduced from the Andamans by Mr. Kurz. in 1866; fld. 1867."

Fig. 1, flower; 2, lip; 3, column; 4, pollinia :—*all enlarged.*

PLATE 53.

LUISIA GROVESII, *Hook. f.*

L. Grovesii, caule gracile elongato ramoso læve, foliis 6—12 pollicaribus crassitie pennae corvinæ teretibus obtusis, spicis brevibus paucifloris bracteis infundibularibus brunneis vaginatis, floribus 1 in. diam., sepalis subæqualibus ovato-oblongis subacutis (petalisque) primulinis, dorsali erecto, lateralibus cymbiformibus labello fere suppositis, petalis auguste linearibus sepalis duplo v. triplo longioribus patenti-decurvis, labelli hypochilio quadrato plano atro-purpureo, epichilio duplo latiore late cordato albo plaga basilari late triangulari atro-purpurea, columna brevissima lata. *Hook. f. Fl. Brit. Ind.* vi. 25.

HAB.—EASTERN BENGAL; in the Lushai Hills, *G. B. Barton Groves.*

Stem flexuose, probably several feet long and much branched, dark green as are the leaves, which are of the same thickness (of a crow-quill), internodes 1 in. *Spikes* arising halfway between the internodes, about ½ in. long; bracts imbricating obliquely, truncate, dark brown. *Flowers* appearing one at a time, flower-buds globose green. *Lip* rather longer than the sepals, probably variable in colour, the epichil being pale purple with darker margins in one drawing and greenish yellow in another. *Column* triangular, fleshy; anther subquadrate, retuse at the top, quite smooth; pollinia ovoid, seated on very short broad caudicle with a narrow gland.

I have seen only one specimen, without locality, from the Calcutta Herbarium, and two drawings, of which the one here reproduced is inscribed "*Cymbidium longipetalum*, 18th April 1861." The other bears the habitat and collector's name given above.

Fig. 1, flower; 2, ovary, lip and column; 3, 4 and 7, pollinia :—*all enlarged.*

PLATE 54.

TRICHOGLOTTIS DAWSONIANA, *Reichb. f.*

T. Dawsoniana; caule robusto scandente superne folioso, foliis patulis loriformibus bilobis lobis rotundatis crasse coriaceis medio profunde canaliculatis, scapo axillari valido erecto laxe paniculato ramoso vaginis paucis brevibus truncatis instructo, paniculæ ramis erecto-patentibus basi bracteatis laxifloris, bracteis pedicellis multo brevioribus late ovatis appressis brunneis, floribus 1—1¼ poll. diam., sepalis petalisque patentibus viridibus acuminatis fusco-rubro vitatto-maculatis spathulato-oblanceolatis, petalis paullo latioribus, labello sepalis dimidio breviore aureo rubro-maculato basi saccato disco piloso, hypochilio utrinque bibrachiato brachiis consimilibus lineari-oblongis apice rotundatis, epichilio lineari apice dilatato 2-lobo, columna vertice 2-cornuta cornubus apice penicillatis. *Reichb. f. in Gard. Chron.* 1872, 699; *Hook. f. Fl. Brit. Ind.* vi. 43. Cleisostoma Dawsonianum, *Reichb. f. l. c.* 1868, 815.

HAB.—TENASSERIM; at Moulmein, *Parish.*

Stem as thick as the little finger, somewhat compressed, green, rooting below the leaves. *Leaves* 3—6 by ¾—1 in., bright green, smooth, deeply channelled, sides convex. *Scape* 6—10 in., as thick as a swan's quill, green; sheaths ¼ in. long, white; panicle 18 in. long, stiff, branches distant, spreading, 6—10 ft. long; bracts at the bases of the branches ⅓ in., of the flower ¼ in.; pedicels with ovary ½—⅔ in. *Lateral sepals* and *petals* widely spreading, subfalcate. *Horns of column* suberect, cylindric, slightly decurved. *Anther* subquadrate, retuse, crested with hair, contracted at the sides.

As I have stated in the Flora of British India in the notes under *Trichoglottis*, I think that Bentham erred in suppressing this genus in the Genera Plantarum, and that taking Blume's *T. retusa* (Bijdr. 360, Tabellen fig. viii) as the type, it is well distinguished by the long narrow processes at the base of the lip and its hairiness, which suggested the generic name. Kurz's *T. quadricornuta* from the Nicobar Isds., judging from his figure and description, generically well accords with *T. retusa* and *T. Dawsoniana*, as does *T. fasciata*, of Manilla, of which there is a fine drawing in the Calcutta Herbarium. The pollinia of *T. Dawsoniana* are large, globose, with short slender straps; not as represented at fig. 5, which is probably imperfect or undeveloped. I also find the sepals and petals in the dried specimens to have each a cusp beneath the apex, a feature not represented in the drawing, which is inscribed "Renanthera from Moulmein, 12-5-70," (the date no doubt of its flowering in the Calcutta Botanical Garden).

Fig. 1, flower; 2, the same with the sepals and petals displaced and lip removed; 3 lip; 4, anther; 5, pollinia (undeveloped?) ;—*all enlarged.*

PLATE 55.

STAUROPSIS UNDULATUS, *Benth. mss.*

S. undulatus; caule flexuoso scapoque creberrime verruculosis, foliis loriformibus apice 2-lobis, lobis rotundatis sinu basi cuspidato, scapo erecto vaginis paucis ovatis instructo, racemo terminali paucifloro, bracteis ovato-lanceolatis pedicellis brevioribus, floribus albis v. roseo suffusis, sepalis petalisque sub-consimilibus oblanceolato-spathulatis acutis undulatis, labello sepalis multo breviore primulino v. albo-roseo striato, hypochilio orbiculari basi saccato columnæ adnato, lobis 2 rotundatis incurvis, epichilio angusto a

latere compresso linguiforme apice truncato v. retuso, disco 3-carinato. *Hook. f. Fl. Brit. Ind.* vi. 27. Vanda undulata, *Lindl. in Journ. Linn. Soc.* iii. 42; *Reichb. f. in. Gard. Chron.* 1875, ii, 212 et 1878, i. 168.

EASTERN SUBTROPICAL HIMALAYA; Sikkim and Bhotan, ascending to 7,000 ft. The KHASIA HILLS, alt. 5—6,000 ft.

Stem 6—10 in. long, flexuous, as thick as a goose-quill, pale greenish, studded with small warts, as on the peduncle and rachis of the raceme and bracts. *Leaves* 3—4 by $\frac{1}{2}$—$\frac{3}{4}$ in., recurved, dark green, terminal lobes unequal, sides convex. *Peduncle* 6—8 in., striate, rigid, bright green, as thick as a crow-quill; sheaths ovate, obtuse; raceme 4—8-fld.; bracts $\frac{1}{3}$—$\frac{1}{2}$ in., green; pedicels with ovary 1—1$\frac{1}{2}$ in., ascending, nearly white. *Flowers* 1$\frac{1}{2}$ in. diam.; sepals and petals spreading and more or less recurved, lateral sepals with their tips often crossing under the lip, which is only half their length and nearly straight. *Column* very short; anther depressed, 2-lobed, red; pollinia nearly globose or ellipsoid, strap moderate inflexed; gland large, transverse.

I have followed Bentham in placing this in *Stauropsis*, though it bears little resemblance to its gigantic, golden flowered congener, *S. giganteus*. From *Vanda* it differs in the base of the lip being adnate to the sides of the column, but it resembles in habit *V. cærulescens*. From *Phalænopsis* it differs in the lip being adnate to the sides of the column, and in wanting a forked appendage on the disk of the lip. Lastly, should the lip prove to be jointed at the base and mobile, which I cannot determine on the dried specimens, it may better be placed in *Arachnanthe*. The warted stems, scapes, &c., are characteristic of this species alone amongst the allied *Vandeæ* known to me.

It will be observed that there is great discrepancy in the accompanying plate between the form of the lip as represented of the natural size and the enlarged figures 1 and 2; the latter are more like what I find in the dried specimens. The colouring of the flowers, too, may admit of correction. The drawing is inscribed "Renanthera; Vanda Jerdoni, Darjeeling, 3rd June 1862, on trees 7,000 ft., T. Anders."

Fig. 1, flower; 2, column and lip; 3, pollinia:—*all enlarged.*

PLATE 56.

PHALÆNOPSIS MANNII, *Reichb. f.*

P. Mannii; subcaulis, foliis sessilibus obovato-oblongis v. oblanceolatis subacutis striatis, pedunculo subradicali valido, bracteis majusculis ovatis acutis viridibus sepalisque oblanceolatis acuminatis flavidis rufo-brunneo pallide maculatis, labello breviter unguiculato, hypochilii lobis lateralibus oblongis falcatis truncatis appendicula furcata interposita, epichilio panduriformi lobis terminalibus elongatis recurvis carunculatis serrulatis. *Reichb. f. in Gard. Chron.* 1871, 902 *et* 1876, 503; *Rolfe l. c.* 1886, ii. 276; *Hook. f. Fl. Brit. Ind.* vi. 30.

ASSAM, *Mann.* SIKKIM HIMALAYA, Rungbee Valley (*Ic. in Hort. Calc.*).

Leaves few, rather flaccid, 6—10 by 2—2$\frac{1}{2}$ in., pale green. *Peduncle* 3—12 in., simple or branched and stout, rachis green decurved or pendulous; bracts $\frac{1}{3}$—$\frac{1}{2}$ in.; flowers few or many, 1$\frac{1}{2}$ in. diam.; sepals broader than the petals. *Lip* white with red markings at the base of the epichil and on the processes of the hypochil; disk with a flattened sword-shaped appendage in front of the forked one. *Column* long, with a short foot, yellow; anther subhemispheric; pollinia pyriform; strap large, spathulate; gland small, forked.

I have seen no Sikkim specimen, but I think there is no doubt that the drawing is intended for *P. Mannii*, though the terminal lobes of the lip are not serrate, either in the descriptions or herbarium specimens of that species. The species is very near *P. Cornu-cervi* of Tenasserim, of which the rachis of the raceme is much flattened and the bracts rounded at the tip; in both the disk of the hypochil presents the usual forked appendage of the genus, with a sword-shaped one in front of it. The rachis of the raceme is probably somewhat flattened in *P. Mannii*, but this is not shown in the drawing. The drawing is inscribed "Phalænopsis, sp. P. Mannii, *Reichb. f.* Rungbee Valley, 1868, 18-3-70."

Fig. 1, flower; 2, the same with the lip and sepal and petal displaced; 3, lip; 4, anther; 5, pollinia:—*all enlarged.*

PLATE 57.

Phalaenopsis tetraspis, *Reichb. f.*

P. tetraspis; subacaulis, foliis obovatis v. cuneato-obovatis striatis, scapo valido simplice v. ramoso ascendente v. erecto, vaginis paucis brevibus, sepalis elliptico-ovatis petalisque angustioribus obtusis dilute virescentibus, labello albo breviter unguiculato, hypochilii lobis lateralibus oblongis falcatis truncatis appendicula 2 furcata interposita, epichilio carnoso oblongo lateraliter compresso apicem versus tumidum superne villoso. *Reichb. f. Xen. Orchid.* ii. 146 *et in Gard. Chron.*, 1881, ii. 562, 656; *Rolfe l. c.* 1886, ii. 277; *Hook. f. Fl. Brit. Ind.* vi. 30, P. Barrii, *King mss.*

Hab.—Chittagong, *Lister* (Ic. in Herb. Calcutta). Andaman Isds., *Berkeley*. Distrib. Sumatra.

Leaves 6—12 by 2—4 in., bright green, subacute. *Scape* described as tall and branched, but simple in the plant here figured, terete, green, few-fld. *Bracts* very short broad and acute, green; pedicel with ovary $1\frac{1}{2}$ in., slender; flower 2 in. diam. Lateral processes of the hypochil yellow; epichil waxy white, convex, obtuse. *Column* rather short, white; tip dorsally toothed; pollinia ovoid; strap large, spathulate, gland small, broad.

I have seen no flowers of this species, which I have described from Reichenbach, and the accompanying drawing. As a species it is closely allied to *P. speciosa*, Reichb. f. of the Andaman Isds., which has white or rosy flowers with darker blotches, toothed lateral lobes of the hypochil, and a dilated mallet-like tip of the epichil; its flowers vary much in colour, and *P. tetraspis* may prove to be a form of it.

The drawing is inscribed "77—119 P. tetraspis, *R. f.*, from Andaman Isds., Barr.; from Chittagong, Mr. Lister; fld. H. B. C. April 1876 and 1877, G. King."

Fig. 1, flower with sepals and petals displaced; 2, lip; 3, front view, and 4 and 5, side views of column; 6, anther and pollinia; 7, strap and gland of pollinia? 8, pollinia:—*all enlarged.*

PLATE 58.

Phalænopsis Kunstleri, *Hook. f.*

P. Kunstleri; subacaulis, foliis obovatis oblanceolatis elliptico-lanceolatisve acutis, scapo folia æquante apice paucifloro, bracteis parvis, sepalis obovatis lateralibus apiculatis petalisque paullo minoribus apice rotundatis sordide flavis infra medium sanguineo pictis,

labello parvo breviter unguiculato, hypochilii lobis late cuneatis falcatis truncatis rubro-striatis callo 2-lobo et appendicula furcata parva interposita, epichilio albo obovato apice rotundato carinis 7 crassis rubris percurso. *Hook. f. Fl. Brit. Ind.* vi. 30.

HAB.—PERAK.—*Kunstler* (in Herb. Calcutta).

Leaves 4—6 in., pale green, very variable in length and breadth. *Scape* rather slender, flexuous; bracts very small, broad green; pedicel with ovary $\frac{3}{4}$ in.; flower 1—$1\frac{1}{4}$ in. diam. *Column* short; pollinia subglobose; strap cuneately obovate; gland quadrate.

I have seen only dried flowers kindly sent me by Dr. King, and the drawing in the Calcutta Herbarium here produced, which latter is inscribed "Perak. Kunstler; in H. B. Calc., Fld., 10-6-84."

Fig. 1, side and 2, front view of flowers, *of the natural size;* 3, lip, *enlarged;* 4, pollinia, *greatly enlarged.*

PLATE 59.

DORITIS WIGHTII, *Benth.*

D. Wightii; subacaulis, foliis oblanceolatis subacutis marginibus undulatis v. subcrispatis, scapis plurimis gracilibus simplicibus v. ramosis, sepalis petalisque obovatis apicibus rotundatis aureis, sepalis lateralibus latioribus oblique retusis, labello albo-rubro picto, hypochilii lobis late cuneato-obovatis truncatis, epichilio parvo cordato sinu rotundato disco basi appendicula furcata instructo. *Benth. in Gen. Plant.* iii. 574; *Hook. f. Fl. Brit. Ind.* vi. 32. Phalænopsis Wightii, *Reichb f. in Bot. Zeit.* 1862, 214. Ærides latifolium, *Thwaites Enum. Pl. Zeyl.* 430.

HAB.—SIKKIM HIMALAYA (*Ic. in Hort. Calcutt.*); BHOTAN, *Lister*; CHITTAGONG, *Groves*; BURMA, at Mougong, *Griffith*; Moulmein, *Parish*; The Circars, *Hegne*; MALABAR, *Wight*; CEYLON, *Thwaites.*

Leaves few, 3—8 by $1\frac{1}{2}$—$2\frac{1}{2}$ in., flaccid, nerveless, costa indistinct. *Scape* as long as the leaves or shorter, inclined or nodding; sheaths few, very short, green; bracts very small, much shorter than the pedicels, which are (with the ovary) $\frac{1}{2}$ in.; flowers $\frac{1}{2}$ in. diam. *Mentum* short, conical.

This is one of the very few Indian epiphytic orchids that has a wide range in distribution, from Sikkim and Burma to Ceylon; and it would be interesting to know how far it varied in colour in different localities. The genus *Doritis* differs from *Phalænopsis* in the conical or spur-like mentum of the lip, but this varies a good deal in length, being shortest in *D. Wightii*, and may not prove to be a reliable character.

The drawing of *D. Wightii* is inscribed "Phalænopis from the Chittagong Hill Tracts, sent by Mr. Barton-Groves, April 1888, G. King. Fl. in H. B. C. June 1888. Fig. by G. Das."

Fig. 1, flower, with a lateral sepal and petal displaced; 2, front and 3 side view of flower; 4, flower with petals and sepals displaced and lip removed; 5 and 6, lip; 7, sidelobe of lip; 8, pollinium:—all but fig. 8 of the *natural size.*

PLATE 60.

DORITIS BRACEANA, *Hook. f.*

D. Braceana; subacaulis, foliis lineari-oblongis obtusis v. subacutis coriaceis, scapis erectis crassis viridibus rubro-punctatis 8—10 floris, bracteis minutis, floribus nutantibus pedicellis crassiusculis decurvis, sepalis petalisque obovato-oblongis obtusis flavis costa rufescente, labelli violacei lobis lateralibus ovato-lanceolatis subacutis appendicula parva furcata interposita, terminali spathulato-obovato apice rotundato, mento elongato calcariforme. *Hook. f. Fl. Brit. Ind.* vi. 196.

HAB.—SIKKIM OR BHOTAN-HIMALAYA, *Gamble.*

Roots very numerous, long, flat, apparently pubescent. *Stem* about $\frac{1}{2}$ in. long, clothed with the brown short sheaths of old leaves. *Leaves* in the drawing, two, one $2\frac{1}{2}$ by nearly 1 in., straight, rounded at both ends, very dark green and grooved down the middle, apparently thickly coriaceous; the other about 2 by $\frac{1}{2}$ in., acute. *Scapes* 2, nearly as thick as a crow-quill from the base to the top of the raceme, with one or two flowerless bracts, dark green, speckled with red-brown; bracts ovate, green, about $\frac{1}{10}$ in. long; pedicels with ovary $\frac{3}{4}$ in. long; flowers nearly 1 in. diam. *Lip* membranous, midlobe narrowed to the base; mentum as long as the erect sidelobes. *Column* large, stout, fleshy; pollinia 4 (2 bipartite ?) subglobose.

A very singular species from its very stout habit, lurid green foliage, and in these respects and its many-fld. erect raceme very unlike its congeners known to me, but with the flower quite that of *D. taenialis* in general character and in the colour of the lip. I have seen no specimens, and have described it from the drawing in Herb. Calcutta, and from notes made by Mr. Brace from the living plants which flowered in the Calcutta Botanic Garden, and which were brought to Mr. Gamble at Darjeeling by a Bhotea collector in 1882. I dedicated it to Mr. Brace, sometime employed in the Herbarium of the Royal Garden, Calcutta.

Fig. 1, flower; 2, the same with the lip removed; 3 lip:—*all enlarged.*

PLATE 61.

SARCOCHILUS (*Pteroceras*) MURICULATUS, *Hook. f.*

S. muriculatus; acaulis v. caule brevi, foliis late oblongis v. loriformibus 2-fidis flaccidis medio canaliculatis, scapo foliis breviore rachique viscidis, sepalis petalisque late ovatis subacutis primulinis v. albis vittis 2 transveris purpureis v. roseis notatis, sepalis lateralibus basi labelli v. pedi columnæ adnatis, labello saccato, sacco conico, lobis lateralibus erectis late ovatis v. quadratis apicibus sinuato-lobulatis intermedio minuto truncato v. bifido pubescente, columna longiuscula, rostello brevi acuto. *Reichb. f. in Gard. Chron.* 1881, *ii.* 198; *Hook. f. Fl. Brit. Ind.* vi. 34.

HAB.—ANDAMAN ISDS., *Kurz*, *Berkeley.*

Stem sometimes 6—8 in. long, rooting below. *Leaves* 6—9 by 1—$1\frac{1}{2}$ in., pale green, unequally bifid, the lobes and sinus acute or rounded. *Scape* rather slender, with the raceme 2—3 in., green speckled with red; bracts broad, minute; pedicels with ovary $\frac{1}{2}$ in.; flowers $\frac{1}{2}$ in. diam., sweet-scented. *Lip* about as long as the sepals, variable

in the size of the lateral lobes. *Column* incurved; anther broadly ovate, acute; pollinia globose or ovoid; strap short, flat; gland small.

There is considerable discrepancy in the analyses made from the original dried specimen collected by Kurz' and Reichenbach's description and my analysis of some detached flowers which accompanied the drawing here reproduced. In the latter the length of the foot of the column, and the insertion along it of the lateral sepals (fig. 1), would indicate that the species should be referred to section VI, according to the arrangement of the species given in the Flora of British India. Much better specimens are required to arrive at a satisfactory knowledge of the lip, which in one flower when spread out took the form of figure 2, being simply cuneiform. The drawing was made under Mr. Brace's directions from a plant that was brought from the Andaman Isds. by a native collector (Abdulla), and which flowered in the Calcutta Botanic Garden, 5-5-84.

Fig. 1, portion of lateral sepal, a petal, lip and column; 2, lip (imperfect?) from a dried flower; 3, column; 4, anther; 5, pollinia:—*all enlarged.*

PLATE 62.

SARCOCHILUS (*Pteroceras*) STENOGLOTTIS, *Hook. f.*

S. stenoglottis; caule brevi robusto, foliis elongatis late loriformibus decurvis sub-bilobis v. emarginatis, scapis deflexis v. pendulis foliis multo brevioribus apices versus plurifloris, bracteis ovatis rufis, floribus stramineis v. fere albis, sepalis oblongis obtusis, petalis angustioribus lineari-oblongis acutis, labello breviter unguiculato a latere valde compresso subcymbiforme marginibus undulatis basi breviter 2-auriculato, in appendicem v. calcar claviforme rectum obtusum producto, columna basi constricta anguste alata, rostello decurvo. *Hook f. Fl. Brit. Ind.* vi. 34.

HAB.—PERAK? *Scortechini.* DISTRIB. Sumatra.

Stem 1—2 in., as thick as the thumb. *Leaves* many, apparently flaccid, 6—12 by 1½—2 in., pale green, nearly flat; sheaths very short and broad. *Scapes* 3—4 in., dark purple or red-brown, sheathed with a few small acute bracts; rachis of many-fld. raceme ½—1 in., rather thickened (or flattened?) subserrate from the peristent bracts (as in sect. *Fornicaria*); pedicels with ovary ½ in., slender. *Flowers* about ½—⅔ in. diam., white with a faint yellow tinge and a few red markings towards the base of the perianth. *Sepals* and *petals* many-nerved. *Lip* very singular, longer than the sepals, white, strongly laterally compressed, curved like a boat, forming a long fleshy narrow cup with undulate lips running half way along the upper margin, and then contracting into a club-shaped terminal appendage, which I take to be a modified spur or sac, and which, instead of being inserted beneath the body of the lip, is in a straight line with the latter. *Anther* shortly beaked, membranous; pollinia oblong; strap spathulate; gland small.

It is not possible to describe the lips of Sarcochili so as to convey any tolerable idea of their form and structure, and to draw them with accuracy is very difficult from living specimens, and impracticable from dried ones. The drawing of the plant here reproduced was inscribed "Malaya Kunstler Fld. in H. B. C. 4-8-83. Sumatra Orchid." The analyses were made by myself from detached flowers in a pocket attached to the drawing.

Fig. 1, dorsal, and 2, lateral sepals; 3, petal; 4, side view of column and lip; 5, front view of lip; 6, anther; 7 pollinium:—*all enlarged.*

PLATE 63.

SARCOCHILUS (*Pteroceras*) BRACHYGLOTTIS, *Hook f.*

S. brachyglottis; caule brevi, foliis decurvis elongato-oblanceolatis apice acuminatis integris v. bicuspidatis, scapo brevi paucifloro, floribus albis, sepalis lanceolatis acutis dorso infra apicem corniculato, petalis oblongo-obovatis obtusis, labello parvo sessili a latere valde compresso subcuneato truncato obtuso 2-lobo, lobo superiore apicem labelli efficiente inferiore in saccum v. calcar producto, columna brevi crassa, rostello erecto. *Hook. f. Fl. Brit. Ind.* vi. 34.

HAB.—PERAK, *King's Collector.*

Stem rather slender. *Leaves* not crowded, 4—8 by 1—1½ in., pale green, keeled beneath, contracted at the base almost into a petiole. *Scape* 1 in., rather stout, green; bracts minute, broad, persistent; pedicels with ovary ½ in.; flowers ½ in. diam. *Sepals* and *petals* faintly tinged with pink. *Lip* not half the length of the sepals, inserted by a narrow base to the base of the column, very much compressed laterally, nearly as deep as long, hollow, with a narrow slit along the top, produced into a rounded boss or spur below the solid obtuse tip. *Column* with the clinandrium almost dorsal, and the rostellum (at length 2-fid.) hence suberect. *Anther* depressed, beaked; pollinia globose, strap narrow, gland not large.

A very well marked species both in habit, leaf, and flowers. Described from the drawing and detached flowers accompanying it. It was made from a specimen sent by Kunstler to the Calcutta Botanic Garden, which flowered there, 7th October 1884.

Fig. 1, flower; 2, column and lip; 3, column and lip seen from above; 4, vertical section of lip; 5, side view of column and anther; 6, front view of column; 7 and 8, anther; 9, pollinia :—*all enlarged.*

PLATE 64.

SARCOCHILUS AUREUS, *Hook. f.*

S. aureus; caule brevi robusto superne folioso, foliis patentibus lineari-oblongis v. loriformibus crasse coriaciis 2-fidis, pedunculis plurimis infra-foliaceis foliis brevioribus robustis paucifloris, floribus magnis aureis, sepalis basi columnæ insertis oblongo-lanceolatis acuminatis petalisque angustioribus conniventibus, labello parvo a latere compresso longe unguiculato, ungue stipitiforme striata apicem versus caruncalata, hypochilii crassiusculi lobis lateralibus erectis cuneato-falcatis obovatisve, disco carunculato sacco subdidymo instructo, epichilio parvo erecto 2-lobo, sacco hypochilo quasi imposito. *Hook f. Fl. Brit. Ind.* vi. 35.

HAB.—PERAK, *King's Collector.*

Stem 3—5 in., as thick as the little finger, clothed with the short, compressed pale green fleshy leaf-sheaths, and rooting. *Leaves* 4—10 by 1½—2 in., keeled, rigid, pale green, broadly sessile on the sheaths, narrowed to the acute terminal lobes. *Scapes* from the lower part of the stem below the leaves, from the old but still green lower sheaths. 2—7 in. long, rather thickened in the rachis, green with scattered short, green, ovate-acute bracts; pedicel with ovary ½—¾ in. *Sepals* 1 in., concave; petals nearly as long or

shorter, flat. *Lip* ⅔ as long as the sepals, with the claw nearly as long as the body, and about as long as the side arms, margined with red, perforated as it were from the insertion of the claw to the globose sac or spur, above which is the short caruncled midlobe or epichil. *Column* short, rostellum very short, acute; anther very shortly beaked; pollinia globose; strap subspathulate, gland narrow.

There are several drawings of this beautiful species in the Calcutta collection, made from specimens that had flowered in the Royal Garden. But none are satisfactory as to the analysis of the lip especially. I have seen no specimens except some detached flowers in a pocket attached to the drawing here reproduced; as to which it is difficult to wholly reconcile their lips with those in the drawing, though I think the latter are in the main accurate. The fact is that the distortion of the lip when dried is so great that I think it better to withhold any further attempt at comparing it with that of the drawing further than to observe that in Fig. 2 the circular markings at the top of the claw represent caruncles, and the terminal globose body, the spur, over which rises the epichil. The drawing is made from a plant that flowered in the Calcutta Garden in May 1888.

Fig. 1, side view of flower; 2, ditto with sepals and petals displaced; 3, 4 and 5, anther; 6, pollinia:—*all enlarged*

PLATE 65.

SARCOCHILUS CLADOSTACHYS, *Hook. f.*

S. cladostachys; caule brevi subrobusto, foliis loriformibus bifidis recurvis, pedunculis 2—3 infrafoliaceis foliis multoties brevioribus clavellatis paucifloris, floribus majusculis albidis, labello purpureo picto, sepalis petalisque augustioribus elliptico-lanceolatis acuminatis, labello sepalis breviore angusto a latere compresso longo unguiculato ungue stipitiforme, hypochilii lobis lateralibus oblongis obtusis, epichilio brevi 2-fido hypochilio imposito lobis quadratis retusis calcare globoso, v. (si velis epichilio 3-lobo lobis lateralibus quadratis intermedio globoso). *Hook. f. Fl. Brit. Ind.* vi. 35.

HAB.—PERAK (*Ic. Scortechini*). MALAYA, *Kunstler*.

Stem about an inch long, as thick as the little finger. *Leaves* 6—12 by 1¼—2 in., recurved or pendulous, pale green, flat, keeled. *Peduncles* 1—2 in., flexuous, nearly naked, gradually thickened upward to the obtuse tip; bracts ovate, acute; pedicel with ovary ½ inch; flowers 1½ inch diam., not quite white, rather cream-coloured, perianth spreading, but not widely, the segments narrow, very finely acuminate. *Lip* about ⅓ shorter than the sepals, slightly incurved; claws spotted with purple, as is the spur (or midlobe of the epichil); lobes of the hypochil pale purple. *Column* rather short, rostellum hardly beaked; anther acute in front; pollinia globose.

Described from the drawing, for I have seen no specimens. It is evidently closely allied to *S. aureus*, but is a much less robust plant, with less rigid leaves, much shorter clavellate peduncles, narrower nearly white sepals and petals, with very finely acuminate tips. The structure of the lip is the same, but in this the epichil is developed into two erect lobes. The drawing bears the inscription "Malaya H. H. Kunstler, Fld. Aug. 1887, flowers lasted only two days. Again May 1888, fig., again only two days. G. King."

Fig. 1, flower; 2, the same, with sepals and petals removed; 3, lip; 4 and 5, anther; 6, pollinia:—*all of the natural size.*

PLATE 66.

SARCOCHILUS BERKLEYI, *Reichb. f.*

S. Berkleyi; caule brevi, foliis loriformibus 2-lobis pendulis, pedunculo brevi, racemo elongato multifloro pendulo v. decurvo, bracteis minutis, floribus albis, sepalis lateralibus ovato-rotundatis basi lata columnæ pedis decurrentibus, dorsali minore, petalis late obovatis, labello sepalis longiore breviter unguiculato a latere compresso, hypochilio in calcar compressum clavellatum antice producto, basi 2-brachiato brachiis erectis falcatis obtusis, epichilii lobulis 2 dentiformibus calcari impositis. *Hook. f. Fl. Brit. Ind.* vi. 37. Thrixspermum Berkleyi, *Reichb. f. in Gard. Chron.* 1882, i. 557.

HAB.—NICOBAR ISDS., *Berkeley.*

Stem 1—2 in., as thick as a goose-quill. *Leaves* 6—9 by 1—1¼ in., narrowed from above the middle to the base, rather flaccid, narrowed also at the obtusely unequally 2-lobed point. *Peduncle* short, compressed; raceme 4—6 in.; bracts minute, broad, membranous; pedicel with ovary 1—1¼ in., sigmoidly ascending; flowers horizontal, about 1 in. from the tip of the lip to that of the dorsal sepal, all white or cream-coloured, or with purple markings on the lip; sepals and petals hardly spreading, concave. *Column* rather long, rostellum at length bicuspidate; anther broad, depressed; pollinia 2, globose, strap short broad; gland orbicular. *Capsule* 5 in. long, narrow, curved.

The drawing of which Plate 66 is a reproduction is inscribed "Said to be from the Andamans, fld. H. B. C., 14th October 1886, G. King." It is more probably from the Nicobars, whence Colonel Berkeley's specimens no doubt came, but it may inhabit both localities.

Figs. 1 and 2, flowers; 3, column and lip:—*all of the natural size.*

PLATE 67.

SARCOCHILUS HIRSUTUS, *Hook. f.*

S. hirsutus; caule brevi, foliis loratis 2-lobis infra medium ad basin angustatis, vaginis brevissimis, pedunculis brevibus cum bracteis floribusque hirsutis, floribus fulvis v. aureis rubro-fasciatis, sepalis lateralibus ovato-oblongis obtusis basi lata columnæ pedis elongati decurrentibus, dorso infra apicem corniculatis, petalis oblongo-obovatis obtusis, labello breviter unguiculato, epichilio in calcar elongato-conicum antice producto et basin versus subtus gibbo, lobis lateralibus falcatis acutis apicibus oblique truncatis et serrulatis, disco inter lobos squamis lamellisve 2 transversis instructo, quarum portica lata truncata et dentata inter lobos hypochilii interposita, antica (epichilio ?) multo minore (postico antiposita). *Hook. f. Fl. Brit. Ind.* vi., 38.

HAB.—PERAK, *Kunstler.*

Stem short, stout. *Leaves* 4—8 by 1—1½ in., flat, keeled, pale green, apparently flaccid and probably drooping. *Peduncles* from the old sheaths, 1—1½ in. long, stout, green, suberect, 4—8 fld; bracts rather large, broadly ovate, green; pedicel with ovary ½ in.; flowers subglobose, ⅔ in. diam. if expanded. *Sepals* apiculate behind the rounded apex,

and petals many-nerved. *Lip* about as long as the sepals; claw dilating into a cup-shaped spur, in front of which are the erect, wing-like lobes or arms of the hypochil, which is produced beyond them into a broad projecting spur with a subulate point; between the lobes of the hypochil is a shorter erect transverse membranous plate, truncate, notched in the middle and toothed, and in front of that again is a much smaller one which I have assumed to be a very rudimentary epichil, but this is little better than a guess.

Described from the drawing, and a very few detached flowers in a very bad state contained in an attached pocket. The analysis of the lip of the latter was most difficult, and, though conducted with extreme care, I cannot vouch for its perfect accuracy. The fact is that the parts of the lip, as usually disposed in orchids, are so deformed and mixed up, as it were, in this and the six preceding *Sarcochili* that it is very difficult from dried specimens or the analyses of native artists to pronounce on their nature and relations.

Fig. 1, flower with a sepal and a petal removed; 2, dorsal sepal; 3, petal; 4, front, and 5, back view of lip; 6, front, and 7, side view of column and anther; 8, anther; 9, pollinium:—*all enlarged.*

PLATE 68.

VANDA (*Cristatæ*) PUMILA, *Hook. f.*

V. pumila, caulibus brevibus, foliis loriformibus recurvis concavis apice 2-lobis lobo altero præmorso altero rotundato, pedunculo brevi paucifloro, floribus primulinis v. albis, sepalis lateralibus ovatis v. lineari-oblongis acutis incurvis, dorsali angustiore petalis linearibus acutis, labelli purpurei v. rubro picti, lobis lateralibus oblongis v. rotundatis, terminali late ovato obtuso, calcare conico lobo terminali æquilongo. *Hook. f. Fl. Brit. Ind.* vi. 53. V. cristata, var. *Lindl. Fol. Orchid. Vanda p.* 10.

HAB.—SIKKIM AND BHOTAN HIMALAYA, alt. 2,000 ft.

Stems 1—2 in., tufted, stout. *Leaves* 3—5 in., pale, bright green. *Peduncle* from near the base of the stem, 1—2 in., rather flexuous, with one or two ovate acute bracts; floral bracts similar, $\frac{1}{6}$ in. long; pedicel with ovary 1—1$\frac{1}{4}$ in. *Sepals* $\frac{2}{3}$ in. long; petals rather shorter. *Lip* $\frac{1}{3}$ shorter than the sepals, rather fleshy. *Column* very short; pollinia small, globose, strap short, gland large.

A very distinct species belonging to the small group with *V. cristata*. Lindl. and *V. alpina*, Lindl. It is smaller than either, with the lip of the latter, but furnished with a long conical spur which at once distinguishes it. As with those species, the flowers resemble in their incurved sepals and petals the genus *Luisia*, to which indeed Lindley referred *V. alpina*, but their habit is totally different. The form of the flowers is not well given in Plate 68, but is admirably well rendered in a drawing of the same plant in the Cathcart collection of Sikkim orchids at Kew, in which the flowers are represented as white and the lip as marked with purple, not the bright red here depicted.

The Calcutta drawing is inscribed "Vanda cristata, Lindl., var. β, grown at Mungpo, Darjeeling, 1888. Brought from Bhotan, 1887; said to grow at 2,000 ft."

Fig. 1, flower with the lateral sepals removed; 2, flower with the sepals and petals displaced and lip removed; 3, side and 4, front view of lip; 5 and 6, anther; 7 and 8, pollinia:—all except figs. 3 and 4 *enlarged.*

PLATE 69.

SACCOLABIUM (*Micranthæ*) INCONSPICUUM, *Hook. f.*

S. inconsipcuum; caulibus intricatim cœspitosis teretibus ramosis, foliis 2—3-pollicaribus funciformibus teretibus obtusis, floribus parvis pallidis breviter pedicellatis pedunculo perbrevi fasciculatis, sepalis petalisque late ovatis v. ovato-oblongis apicibus recurvis subacutis, labelli hypochilio hemispherico marginibus integerrimi, epichilio margine hypochilii sessili triangulari-ovato retuso v. emarginato ? inconspicuo. *Hook. f. Fl. Brit. Ind.* vi. 56. Cymbidium inconspicuum, *Wall. mss.*

HAB.—ASSAM, *Jenkins* (*Ic. in Herb. Calcutt*).

Stems 6—8 in., as thick as a duck's quill, terete, flexuous, red-brown, striate, rooting at the base only, probably forming pendulous interlaced tufts; internodes about ½ in. *Leaves* about as thick as the stems, straight or slightly curved, dark green. *Flowers* ¼ in. diam., in almost sessile supra-axillary tufts of 6—8; pedicel with ovary ⅛—⅙ in., curved. *Sepals* and *petals* greenish white. *Lip* large for the size of the flower, with a cup-shaped truly hemispheric hypochil, apparently fleshy, with no indication of lateral lobes, green, purplish at the base, margins slightly everted; epichil greenish white, as broad as the hypochil, flat, without ridges, warts, or nerves. *Column* very stout indeed, purple, clinandrium quite entire; anther broad, flattish, 2-celled, golden yellow; pollinia globose; strap short, rather slender, gland ovate.

A remarkable species, quite unlike any other, of which there is an excellent drawing (reproduced here) in the Calcutta Herbarium, executed under Wallich's superintendence, but of which I can find no specimen in his Herbarium, nor have I seen it in any other. The specimen figured is only a portion of that in the original. In the shape of the lip, and especially the hemispheric hypochil, it precisely accords with that of the section *Calceolaria*, but it resembles in habit no species of that group in foliage and inflorescence, and further differs in the perfectly smooth epichil. The same characters remove it from the section *Acampe*. In the Flora of British India I doubtfully referred it to *Saccolabium*; and after reviewing the *Cymbidieæ*, I see no possibility of referring it to any other genus.

The drawing is inscribed in Wallich's handwriting, "90 Cymbidium inconspicuum, Wall., Capt. Jenkins, from Lower Assam."

Fig. 1, flower; 2, the same with the sepals and petals displaced; 3 and 4, anther; 5 pollinium:—*all enlarged.*

PLATE 70.

SACCOLABIUM (*Micranthæ*) GEMMATUM, *Lindl.*

S. gemmatum; caule elongato flexuoso folioso, foliis linearibus decurvatis semiteretibus apicibus 2—3 dentatis, racemis elongatis gracillimis paniculatim ramosis multifloris, floribus minutis amethystinis v. albis purpureo pictis secus ramos paniculae sessilibus iisque parallelis fere clausis, sepalis ovato-oblongis obtusis concavis papillosis, petalis obovatis, labello oblongo v. obovato-oblongo subcymbiforme carnoso crenulato, lobis lateralibus obscuris, calcare sepalis æquilongo cylindrico obtuso. *Lindl. in Bot. Reg.* 1838, *Misc.* 50; *Walp. Ann.* vi. 885; *Hook. f. Fl. Brit. Ind.* vi. 55 (*errore gemminatum*).

HAB.—SIKKIM and BHOTAN HIMALAYA, alt. 3—5,000 feet. KHASIA and JYNTIA HILLS, alt. 2—4,000 feet, common.

Stems 6—12 in. or more, rooting at the base, strongly decurved. *Leaves* 2—4 in., fleshy, very variable in breadth, from terete and deeply channelled to linear and concave, always recurved. *Peduncle* slender, 2—4 in., terete, green; branches of panicle spreading, filiform, flexuous, green with ovate acute bracts at the forks; flowers ⅛ in. long, rather remote, quite sessile and parallel to the rachis; bracts broadly ovate, much shorter than the short deeply grooved ovary with alternate green and red ribs. *Sepals* all amethystine purple or tipped with white; petals purple. *Lip* white, rather longer than the sepals, very variable in shape, sometimes linguiform, nearly flat, at others laterally compressed, blade white; spur variable in length, purple, sometimes cylindric and nearly as long as the ovary, at others shorter and conic. *Column* very short indeed, with two terminal subulate processes. *Anther* broadly ovate; pollinia globose; strap broad, tongue-shaped, gland large. *Capsule* sub-sessile, ⅙—⅓ in. long, oblong, curved.

The drawing was made by myself in Sikkim, 2nd August 1848. In another, from the Calcutta collection of drawings, the sepals are of a very pale rose purple.

Fig. 1, side view of flower; 2, ovary and lip; 3, lip; 4, top of ovary and column; 5 and 6, pollinia:—*all enlarged.*

PLATE 71.

SACCOLABIUM (*Micranthæ*) PENANGIANUM, *Hook. f.*

S. penangianum; caulibus fasciculatis flexuosis, foliis linearibus v. anguste lineari-lanceolatis canaliculatis oblique bidentatis, floribus minutis in racemum parvum puberulum breviter pedunculatum confertis, sepalis lateralibus late ovato-oblongis subacutis 1-nerviis, dorsali multo minore obtuso obovato, petalis lanceolatis acutis, labello supero sepalis multoties longiore in cornu incurvum compressum acutum longe ultra lobos producto, disco carnoso, lobis lateralibus rotundatis, terminali minuto unguiforme lateralibus apposito. *Hook, f. Fl. Brit. Ind.* vi. 57 *et in Hook. Ic., Pl. t.* 2129B.

HAB.—PENANG, on the Sonkey river, *Curtis.* PERAK, *Kunstler* (*in Herb. Calcutt.*).

Stems 4—5 in., apparently tufted, as thick as a crow-quill, internodes ½ in. *Leaves* 2½—4 by ⅓ in., spreading, curved, keeled, tip usually acutely notched as it were on one side, bright green. *Racemes* with the very short peduncle 1—1½ in., fruiting decurved; bracts subulate; flowers subsessile, ⅙ in. from the dorsal sepal to the tip of the lip, pale yellow or whitish with a few specks of red. *Lateral sepals* very oblique, dorsal obovate-oblong rounded at the tip. *Petals* 1-nerved, much smaller than the sepals. *Lip* erect, much larger than the rest of the flower, forming a compressed or angled more or less inflated incurved acute horn with the orifice and 3 small lobes close under the column, base contracted. *Column* very short; rostellum inconspicuous; anther hemispheric; pollinia globose; strap rather long, dilated upwards, gland minute. *Capsules* ¼ in. long, sessile, oblong, crowded, reflexed.

A very peculiar little species, from the minute reversed erect flowers, and minute lobes of the lip. The analyses were made by me from dried Penang specimens, and they are, I hope, fairly accurate.

The drawing of the whole plant is from Perak specimens sent by Kunstler which "flowered in the Rl. Bot. Garden, Calcutta, 14-7-84."

Fig. 1, flower; 2, dorsal and 3, lateral sepals; 4, petal; 5, ovary, lip and column; 6, column and upper part of lip; 7, column; 8, anther including pollinia; 9, rostellum; 10 pollinia:—*all greatly enlarged.*

PLATE 72.

SACCOLABIUM (*Micranthæ*) LANATUM, *Hook. f.*

S. lanatum; caule brevi robusto, foliis lineari-oblongis v. breviter loriformibus obtuse 2-lobis profunde canaliculatis crasse coriaceis, pedunculo foliis longiore et spica elongata densiflora pendula tomentosis v. lanatis, bracteis magnis imbricatis ovatis acuminatis flores velantibus caducis, sepalis lateralibus late ovatis, dorsali elliptico-oblongo, petalis obovato-oblongis, labello basi saccato sepalis paullo longiore lobis lateralibus triangulari-ovatis integris v. unidentatis terminali ovato 2-cuspidato, disco callo pubescente instructo. *Hook. f. Fl. Brit. Ind.* vi. 60. Cleisostoma lanatum, *Lindl. in Journ. Hort. Soc.* iv. 264; *Walp. Ann.* vi. 889.

HAB.—TENASSERIM; at Moulmein, *Parish, Scott.*

Stem 1—2 in., as stout as a swan's quill. *Leaves* 3—4 by 1—1¼ in., distichous, spreading, dark green, lobes equal rounded, sinus acute. *Peduncle* 3—6 in., flexuous, pale green, simple or branched; sheaths tubular, appressed; spike 4—7 in. long, young, clothed with densely imbricating long-pointed pale green tomentose bracts that completely conceal the flowers, and are very caducous; flowers ¼ in. diam., pale green, striped with dull purple. *Sepals* pubescent, tips of lateral compressed and almost winged at the back; petals ciliate. *Lip* with the side-lobes ciliate and usually notched on the lower margin; tips of mid-lobe divaricate and recurved; sac hemispheric with a pubescent ridge encircling the mouth within; the pubescent callus of the disc descending into the sac for a short way. *Column* not long, compressed upwards laterally; rostellum not prominent. *Anther* nearly flat, membranous, lanceolate from a broad 2-lobed base; pollinia small, globose, seated one in the terminal sinus of each arm of the long forked strap, which is dilated upward from a very slender base, and then forks, each arm being flat and broader than its pollinium; gland small, oblong or ovate-lanceolate.

A very remarkable plant, not satisfactorily referable to any genus, though, as it appears to me, technically a *Saccolabium.* The woolly peduncle and spike and the large deciduous bracts concealing the flowers are unlike any of its congeners or their allies. Lindley placed it in *Cleisostoma,* to which genus it seems allied in the pubescent ring encircling the mouth of the sac of the lip, but I find no trace of the callus or sac underneath the column which is characteristic of *Cleisostoma.* The forked strap of the pollinia is very singular. The drawing here reproduced is inscribed "Burma, Mr. Scott, June 1861."

Fig. 1, flower; 2, side view of column and lip; 3, section of lip; 4 and 5, anther; 6 pollinia:—*all enlarged.*

PLATE 73.

SACCOLABIUM (*Distichophylla*) DISTICHUM, *Lindl.*

S. distichum; caulibus elongatis gracilibus pendulis foliosis, foliis inter minoribus distichis elliptico-lanceolatis 2—3-cuspidatis, pedunculis brevibus paucifloris foliis multo brevioribus, floribus flavis subsessilibus, sepalis petalisque subaequalibus obovato-oblongis obtusis, labello sacciforme, lobis lateralibus brevissimis rotundatis, terminali parvo semicirculari carnosulo basi callo didymo instructo. *Lindl. in Journ. Linn. Soc.* iii. 36; *Reichb. f. Ottia Hamburg* 43; *Hook. f. Fl. Brit. Ind.* vi. 64.

HAB.—SIKKIM HIMALAYA, alt. 6—8,000 ft. KHASIA HILLS, alt. 5—6,000 ft. MUNNIPORE, alt. 6—9,000 ft., *Watt.*

Stems 4—8 in., soft, filiform when dry, rooting here and there, branched at the base and tufted. *Leaves* above 1 in., sessile, deeply channelled, keeled, bright green, speckled with brown. *Peduncles* rarely as long or longer than the leaves, slender; bracts minute; flowers about $\frac{1}{3}$ in. diam., greenish yellow, obscurely speckled with purple. *Sepals* and *petals* spreading, tips rounded. *Lip* about as long as the sepals, base of sac rounded, surface perfectly smooth within, without calli or pubescence. *Column* very short; rostellum short; anther ovate-lanceolate; pollinia globose, strap linear; gland large, oblong. *Capsules* $\frac{2}{3}$ in., fusiform.

The drawing reproduced here is inscribed "Sikkim, 6,000 ft., Sept. 1876, *G. King.*" The analyses are my own from dried specimens.

Fig. 1, flower; 2, lip; 3, section of lip; 4, front, and 5, side view of column; 6, pollinia;—*all enlarged.*

PLATE 74.

SACCOLABIUM (*Distichophylla*) TENUICAULE, *Hook. f.*

S. tenuicaule; caulibus elongatis gracilibus pendulis foliosis sulcatis flexuosis, foliis distichis linearibus v. lineari-lanceolatis obtusis, floribus tuberculis folio oppositis sessilibus solitariis paucisve parvis flavis, sepalis lateralibus oblique ovatis acutis, petalis brevioribus ovatis acutis, labello basi in calcar gibboso-clavatum subincurvum producto, lobis lateralibus erectis ovatis acutis terminali paullo longiore oblongo incurvo apice truncato 2-cuspidato dente interjecto. *Hook. f. Fl. Brit. Ind.* vi. 64.

HAB.—PENANG; on West Hill, *Curtis.* PERAK, *Scortechini, Wray.*

Stem 6—8 in, as thick as a crow-quill, simple or branched, rooting at the base only, green, deeply grooved. *Leaves* 3—4 in. by $\frac{1}{4}$—$\frac{1}{3}$ in., channelled and keeled, spreading, bright green. *Flowers* $\frac{1}{4}$ in. diam., yellow or yellow-green; bracts microscopic; ovary very short; sepals 3-nerved, dorsal as large as the lateral; petals 1-nerved. *Lip* as long as the sepals, side-lobes sparingly irregularly obtusely toothed, mid-lobe rather longer; spur with a ring of hairs at the constriction within, but no callus. *Column* short; rostellum projecting styliform. *Anther* membranous, almost flat, acuminate; pollinia small, reniform, strap broad with a dilated subreniform top, gland small.

Mo. Bot. Garden,
1896.

Except in habit of growth, which approaches that of *S. distichum*, this is not nearly allied to any other species of the genus. The solitary or fascicled flower, sessile on leaf-opposed brown tubercles of the stem, which are covered with microscopic bracts, is very peculiar.

The drawing is inscribed "no label sent, H. B. C., 16-7-84." The analyses 1—3 are on the drawing; those marked A1 to A4 are by Miss Smith at Kew under my eye from Penang specimens.

Fig. 1, flower, with the sepals and petals displaced and lip removed; 2, lip seen from above, and 3, from the side. A1, flower; A2, column, and lip; A3, section of lip; A4, lip seen from above:—*all greatly enlarged.*

PLATE 75.

SACCOLABIUM (*Speciosae*) TRICHROMUM, *Reichb. f.*

S. trichromum; caule elongato robusto, foliis elongatis loriformibus 2-lobis lobis rotundatis, racemis supra-axillaribus foliis multoties longioribus breviter pedunculatis multi-secundi-floris, floribus albis roseo maculatis, sepalis lineari-oblongis acutis, petalis latioribus, labello cornuforme sepalis duplo longiore cylindraceo incurvo apice rotundato, lobis lateralibus brevibus rotundatis terminali parvo basi ore incluso callo uncinato instructo. *Reichb. f. in Hamb. Gartenzeit*, 1859, 51 *et Xen. Orchid* 119, *t.* 139; *Hook. f. Fl. Brit. Ind.* vi. 65. S. pallens, *Lindl.* (non *Cathcart*), *in Journ. Linn. Soc.* iii. 35.

HAB.—SIKKIM HIMALAYA (*Ic. Cathcart*). BHOTAN and ASSAM (*Ic. in Herb. Calcutta*).

Stem 1—3 feet, as thick as a swan's quill, rooting at the base only, cylindric and clothed with sheaths below, leafy (and flattened?) above; internodes 1 in. *Leaves* 7—10 by $\frac{3}{4}$—1 in., spreading, flat, deeply channelled, bright green. *Racemes* with the rather stout ascending terete green peduncle 3—5 in.; bracts very small, ovate, brown; pedicels slender, with the ovary $\frac{2}{3}$ in., usually sigmoid, all curving to one side; flowers $\frac{2}{3}$ in. long. *Sepals* and *petals* $\frac{1}{4}$ in. long, spreading, white or cream-coloured with pink midrib. *Lip* white or yellowish, spotted or blotched with pink. *Column* (rather rostellum) small. *Anther* flat, acute; pollinia globose, strap slender; gland small lanceolate.

A very distinct species of the section which I have called *Speciosæ*, to which belong the well-known *S. ampullaceum* (*Aerides ampullaceum*, Roxb.) and *S. curvifolium*, Lindl. (*S. rubrum*, Lindl.), from both of which it is at once distinguished by the small lax-fld. one-sided raceme and curved spur.

The plate is a reproduction of a portion of a full-sized drawing in the Cathcart collection at Kew. Of the figures, that of the section of the lip represents the gland as misplaced; it should be within the mouth of the lip below the base of the midlobe, as badly represented at figure 8. Lindley by an oversight attributed the specific name of *pallens* to Mr. Cathcart, who never attempted to name a plant.

Figure 1, side view; 2, back view, and 3, front view of flower; 4, flower with the dorsal sepal removed; 5, side and 7, front view of lip; 6, lip cut open:—*all of the natural size:* 8, mouth of lip; 9, anther; 10, pollinia:—*all enlarged.*

PLATE 76.

SARCANTHUS APPENDICULATUS, *Hook. f.*

S. appendiculatus; caulibus elongatis teretibus, foliis elongatis teretibus obtusis, pedunculo elongato, racemo terminale brevi paucifloro pendulo, sepalis oblongo-obovatis

petalisque paullo augustioribus, labelli calcare infundibulari conico sub-incurvo 2-loculari lobis parvis, lateralibus rotundatis v. acutis, terminali brevi incurvo. *Hook f. Fl. Brit. Ind.* vi. 67. S. teretifolius. *Reichb. f. in Trans. Linn. Soc.* xxx. 136 (*non Lindl.*). Aerides appendiculatum, *Wall. Cat. n.* 7315; *Lindl. Gen. and Sp. Orchid*, 242.

HAB.—BURMAH; TAVOY, *Wallich*; MOULMEIN, *Griffith*, *Parish*. KHASIA HILLS and ASSAM, *Simons* (*Ic. in Herb. Calcutta*).

Stems 6—12 in., from a branching pubescent rooting rhizome, as thick as a duck's quill, curved or flexuous, dark green spotted with red, throwing out here and there very long, stout roots. *Leaves* 3—5 in., as thick as the stem, curved, dark green, speckled towards the base. *Peduncle* supra-axillary, 6—10 in., slender, decurved, dark green with a few short brown sheaths; raceme 2 in., rachis rather thickened; bracts small; pedicel very short, with the ovary $\frac{1}{3}$ in. long; flowers $\frac{2}{3}$ in. diam. *Sepals* and *petals* widely spreading, subacute, yellowish, with three broad red nerves, the outer pair branching outwards. *Lip* rather shorter than the sepals; spur yellow, streaked and tipped with red; lobes pink, nearly triangular in outline, as broad from the base of the column to the midlobe as from the latter to the base of the spur; midlobe with a callus at its base; spur with "a transverse septum towards the base"?

In the Flora of British India I have described *S. appendiculatus* from Moulmein specimens as having flowers $\frac{1}{6}$ in. diam., with yellow green sepals and petals, the side lobes of the lip acuminate, the spur with a longitudinal septum, and the pollinia as very large. The above suggests that the Khasian plant here figured may be specifically different from the Moulmein one, which is the type of the species. The latter will be figured in the "Icones Plantarum."

Figure 1, flower; 2, ovary, column and lip; 3, the same with section of lip; 4, 5, anther; 6, pollinia:—*all enlarged.*

PLATE 77.

SARCANTHUS SECUNDUS, *Griff.*

S. secundus; caulibus elongatis gracilibus teretibus, foliis elongatis anguste lineari ensiformibus-lanceolatisve longe acuminatis basin versus angustatis, racemis gracilibus laxifloris foliis multo brevioribus, floribus subsecundis pallide rufo-flavis, sepalis obovato-oblongis petalisque obtusis, labello crasse carnoso conico-infundibulari obtuso, lobis lateralibus dentiformibus terminali parvo ovato acuto incurvo. *Griff. Notul.* iii, 302 *et Ic. Pl. Asiat.* t. 336; *Hook. f. Fl. Brit. Ind.* vi. 67. Micropera pallida, *Lindl. in. Wall. cat. n.* 7321, *partim* (*non Gen. and Sp. Orchid*).

HAB.—UPPER ASSAM, *Griffith*; DUPHLA HILLS, *Lister* (*Ic. in Herb. Calcutta*); SYLHET, *Wallich*.

Stem 8—18 in., about as thick as a goose-quill, rooting towards the leafless sheathed base, leafy above. *Leaves* 4—7 by $\frac{1}{3}$—$\frac{1}{2}$ in., distichous, spreading and recurved, deeply channelled, 5-nerved, bright green, obscurely retuse on one side at some distance ($\frac{3}{4}$ in.) below the very slender subulate apex. *Racemes* shorter than the leaves, pendulous; bracts minute; pedicel with ovary $\frac{1}{4}$ in., nearly straight; flowers $\frac{1}{2}$ in, diam. *Sepals* and *petals* subequal, widely spreading, dull reddish with a broad central pale yellow diffused band, and sometimes margined. *Lip* with spur about as long as the sepals;

spur slightly incurved, with a very large 2-lobed compressed caruncle under the column within, and a vertical plate descending from the base of the midlobe to below the middle of the spur, dividing the base of the latter into two parallel cells; the upper part of this plate fits into the cleft of the 2-lobed caruncle. *Column* very stout, rostellum subulate. *Anther* broad, flat, suddenly contracted in front into a long subulate beak; pollinia large, globose, cleft; strap slender, gland minute. *Capsule* $\frac{1}{2}$—$\frac{3}{4}$ in. ellipsoid or oblong, ribs not prominent.

A little known plant, referred to by Lindley in his paper on Indian orchids in the Journal of the Linnæan Society (iii, 39) under *S. peninsularis* as possibly that plant; to which it is indeed closely allied, but *S. peninsularis* differs in the ribbed stem and much smaller flowers.

The drawing here reproduced is inscribed "Sarcanthus oxypyhllus, Wall." in Wallich's handwriting; to which is added "Duphla Hills, Mr. Lister, fld. June 1875."

Fig. 1, flower; 2, column and lip; 3, section of lip; 4, anther; 5, pollinia:—*all enlarged.*

PLATE 78.

SARCANTHUS INSECTIFER, *Reichb. f.*

S. insectifer; caule robusto compresso elongato radicante folioso, foliis brevibus distichis oblongis 2-lobis crasse coriaceis amplexicaulibus, spicis subsessilibus brevibus paucifloris sepalis late oblongis petalisque obovato-oblongis obtusis patentibus rubro striatis, labelli calcare brevi conico-infundibulari, lobis lateralibus brevissimis rotundatis, terminali triangulari-ovato carnoso roseo, columna brevissima apice 2-aristata aristis recurvis. *Reichb. f. in Bot. Zeit.* 1857, 159; *Hook. f. Fl. Brit. Ind.* vi. 68.

HAB.—BEHAR, J. D. H. CACHAR, *Mann.* CHITTAGONG (*Ic. in. Hort. Calcutta*). TENASSERIM, *Parish.*

Stem scandent, as thick as a swan's quill or less, green. *Leaves* $\frac{1}{2}$—$1\frac{1}{2}$ by $\frac{1}{2}$—$\frac{3}{4}$ in., many and sometimes almost imbricating, deeply channelled, nerveless, terminal lobes unequal with sometimes an interposed mucro. *Spikes* $\frac{1}{2}$ in., subsessile; bracts minute, deciduous; ovary short; flowers $\frac{1}{2}$ in. diam. *Sepals* and *petals* greenish yellow, with red stripes. *Lip* rather longer than the sepals; terminal lobe as long and as broad as the spur, bright rose-coloured or purplish, sometimes margined with white; spur with a large 2-fid callus below the column within, semiseptate by a plate descending from the base of the midlobe. *Column* very stout, clinandrium horizontal or reclinate, with the two awns from the sides of the column in front arched over it; rostellum obscure. *Anther* flat, subquadrate, truncate or broadly retuse in front; pollinia large, globose; strap very short and broad; gland transverse.

A remarkable and exceptionally bright-flowered species, of which I have seen several drawings displaying a good deal of variation in the colour of the flowers. That here reproduced (for the original is a full-sized folio) is inscribed "Saccolab. carinatum, Hot Springs near Hatgur and Seetakoond Hill"—the latter is one of the Chittagong Hills.

Fig. 1, side and 2, front view of flower; 3, column; 4 and 5, anther; 6, pollinia.

PLATE 79.

SARCANTHUS PALLIDUS, *Lindl.*

S. pallidus; caule valde robusto, foliis elongatis late loriformibus inæqualiter 2-lobis, panicula ramosa effusa longe pedunculata, ramis patentibus multi-laxifloris, sepalis petalisque oblongis obtusis rubro-purpureo striatis, labelli carnosi albi calcare subcylindraceo incurvo subtruncato, lobis lateralibus brevissimis truncatis, terminali brevi ovato incurvo apice rostrato. *Lindl. in Bot. Reg.*, 1840, *Misc.* 78 *et in Journ. Linn. Soc.* iii. 39; *Hook. f. Fl. Brit. Ind.* vi. 68. S. tricolor, *Reichb. f. in Bonplandia* ii. 219. Saccolabium racemiferum, *Lindl. Gen. and Sp. Orchid.*, 224. Aerides racemiferum, *Wall. mss.*

HAB.—EASTERN NEPAL, alt. 4,000 ft. J. D. H. BHOTAN and the KHASIA HILLS, alt. 4—6,000 ft., *Wallich.* BURMA, Berkeley.

Stem very short, as thick as the thumb, leafy to the base; roots as thick as a goose-quill. *Leaves* 10—14 by 1½—2 in., spreading and recurved, thickly coriaceous, deeply channelled, dark green, terminal lobes rounded; sheaths short, open. *Panicle* with *peduncle* 2—3 ft., nodding; branches spreading, 2—3 in. long, slender, laxly many-fld.; bracts at the forks and floral very small, ovate-lanceolate or subulate, persistent; pedicels with ovary spreading, ⅓ in.; flowers about ⅓ in. diam., fleshy, dark or pale reddish-purple with a median broad pale band. *Spur* with very thick walls, septate and 2-celled longitudinally below the middle, and with a large 2-fid. caruncle below the column nearly closing the mouth. *Column* very short and stout, rostellum obscure; *anther* broadly ovate, acuminate, flat; pollinia large, oblong or globose, cleft; strap slender, dilated above, gland small. *Capsule* ⅔ in. ellipsoid or clavate.

One of the largest species of the genus.

The drawing from which the plate is taken is inscribed "Mr. Gibson's Churra collection. Sarcanthus affinis, Wall. (Vanda paniculata Br.?)" in Wallich's handwriting.

Fig. 1, flower; 2, section through flower; 3 and 4, anther; 4, pollinia:—*all enlarged.*

PLATE 80.

CLEISOSTOMA ANDAMANICUM, *Hook. f.*

C. andamanicum; caule crasso elongato, foliis loriformibus coriaceis 2-lobis, pedunculo elongato, floribus parvis racemosis, racemis spiciformibus ramos paniculæ laxæ terminantibus viridi-flavescentibus brunneo suffusis, sepalis petalisque late obovato-oblongis, obtusis, labello sacciforme cylindraceo lobis lateralibus truncatis, terminali brevissimo erecto. *Hook. f. Fl. Brit. Ind.* vi. 71.

HAB.—SOUTH ANDAMAN ISLD., *Kurz.*

Stem as thick as a goose-quill, rooting, green; internodes 1—1½ in. *Leaves* 4—6 by ½—¾ in., spreading and recurved, channelled; terminal lobes unequal, rounded. *Peduncle* infra-foliar, 5—7 in., rather rigid, green, speckled with red; sheaths short annular; branches about 1 in. long; racemes (or spikes) 1—1½ in., ovoid, many-fld.; bracts small, ovate;

pedicels with ovary $\frac{1}{4}$ in., flower $\frac{1}{4}$ in. diam. *Sepals* and *petals* widely spreading, thick, greenish yellow, with a broad streaked red purple band within the border, or the streaks may be replaced by spots. *Lip* about as long as the sepals, yellow spotted from the middle to the base of the spur; dorsal callus retuse. *Column* very short, stout; clinandrium horizontal, angles obtuse; rostellum short; anther flat, ovate, acuminate; pollinia globose, strap slender, gland medium-sized.

Closely allied to *C. latifolium*, Lindl., a common species in the Malayan Peninsula, which differs in the much broader leaves, stouter stem and peduncles, smaller flower, and in having a reniform caruncled midlobe of the lip.

The drawing of *C. andamanicum* is inscribed "Sarcanthus of Andamans No. 1. Introd. 1867, fld. in H. B. C., April 1868."

Fig. 1, flower; 2, the same with the perianth segments displaced; 3, column and lip, the latter bisected 4, anther 5, pollinia:—*all enlarged.*

PLATE 81.

CLEISOSTOMA RAMOSUM, *Hook. f.*

C. ramosum; caule breve, foliis anguste loriformibus oblique 2-lobis, panicula gracili erecta breviter pedunculata, ramis paucis paucifloris patentibus, floribus parvis breviter pedicellatis, sepalis petalisque obovatis obtusis rufo-fuscis albo viridive marginatis, labelli lobis lateralibus parvis ovatis terminali triangulari-ovato v. rotundato et subtrilobo, disco basique columnæ pubescentibus, calcare uncinato incurvo. *Hook. f. Fl. Brit. Ind.* vi. 72. Saccolabium ramosum, *Lindl. Gen. and Sp. Orchid*, 224. S. flexuosum, *Lindl. in Journ. Linn. Soc.* iii. 36. Oeceocladus flexuosa, *Lindl. in Wall. Cat.* n. 7333 *et Gen. and Sp. Orchid.* 236. Aerides ramosum, *Wall. mss.*

HAB.—SIKKIM HIMALAYA, in hot valleys, J. D. H. LOWER BENGAL, in the Sunderbuns, *Wallich, Clarke.* BURMA, on the Attran river, *Wallich.* MOULMEIN, *Parish.*

Stem 1—3 in., hardly as thick as a goose-quill. *Leaves* few, 3—5 by $\frac{1}{3}$—$\frac{1}{2}$ in., spreading and recurved, terminal lobes rounded. *Peduncle* 1—2 in., green; panicle 4—5 in., branches rather distant, spreading; bracts minute; pedicels with ovary $\frac{1}{6}$ in.; flowers about $\frac{1}{6}$ in. diam. *Sepals* and *petals* widely spreading. *Lip* about as long as the sepals, white, flushed with pink or banded with yellow; spur corniform, acute, mouth hairy, dorsal scale erect, 2-fid., pubescent; side lobes variable in length and midlobe in form. *Column* very short, broad, angles rounded; rostellum very short. *Anther* short, broad; pollinia globose, 4 cleft, (2 very small, *Clarke*); strap dilated upwards, tip contracted; gland small. *Capsule* $\frac{1}{4}$ inch, fusiform.

An insignificant species, presenting a good deal of variation in the length and breadth of the leaves, colour of the flowers, and form of the lobes of the lip, in so far as the analyses of Herbarium specimens shows. The latter (flowers only) accompanied the drawing which was inscribed "Sarcanthus from Col. Perreau, in Calcutta, Fld. in H. B. C., 3rd May 1886.

Fig. 1, front, and 2, dorsal view of flower; 3, front view of column and lip; 4, lip; 5, side view of column and lip; 6, the same with the lip bisected; 7, pollinia:—*all enlarged.*

PLATE 82.

CLEISOSTOMA BREVIPES, *Hook. f.*

C. brevipes; caule valido elongato folioso basi radicante, foliis distichis uniformibus lineari-lanceolatis acutis crasse coriaceis, spicis lateralibus brevibus breviter crasse pedunculatis, rachi crassa cylindracea, bracteis parvis acutis, floribus aureis, petalis sepalisque ovato-oblongis obtusis vittis 2 rubris purpureisve notatis, labelli lobis lateralibus brevibus falcatis acutis, terminali brevi triangulari-hastata apice membranacea bi-aristata disco incrassato, calcare brevi sacciforme.

HAB.—SIKKIM HIMALAYA (*Ic. in Herb. Calcutta*); alt. 5,000 feet, *Gamble*; ASSAM (Hort.).

Stems tufted, 8—12 in., as thick as a goose-quill, curved, leafless and sheathed below, rooting at the base, leafy above, internodes ½—1 in. *Leaves* similar all the way up the stem, 4—6 by ⅔ in., channelled above, stiff, hard, somewhat narrowed at the base, tip almost pungent. *Spike* 1—1½ in., horizontal, green, ⅙ in. diam.; basal sheaths annular; bracts minute, red-brown; ovary ⅙ in.; flowers ⅓—⅔ in. diam. *Sepals* and *petals* widely spreading, subsimilar. *Lip* longer than the sepals, yellow with red markings; spur shining, with a thickened callus at the base of the midlobe, which extends across the mouth of the spur to meet the thick callus at the base of the column, thus closing the orifice. *Column* short, stout, angles rounded. *Pollinia* subquadrate; strap compressed, gland large, 2-partite. *Capsule* 1—1½ in., fusiform, terete, fleshy, striate.

A remarkable species, of which I have examined a fruiting specimen collected by Mr. Gamble in Sikkim, and a living flowering plant sent to Kew from a nursery in England. The latter differs somewhat from the figure here given in the large flowers with more purple bands on the sepals and petals, and in having two awns on the membranous tip of the midlobe of the lip; these may have fallen off in the specimen figured, which was inscribed "Sarcanthus from Sikkim, No. 2, Botanic Garden, July 1867."

Fig. 1, flower; 2, front and 3, side view of column and lip:—*all enlarged.*

PLATE 83.

CLEISOSTOMA SPICATUM, *Lindl.*

C. spicatum; caule crasso elongato radicante folioso, foliis latis oblongis 2-lobis, pedunculo oppositifolio crasso decurvo, spica foliis longiore pendula multiflora, bracteis ovato-subulatis demum deflexis, sepalis petalisque minoribus ovatis subacutis fusco-rubris vitta media marginibusque aureis, labelli lobis lateralibus rotundatis terminali parvo ovato carnoso, calcare magno basi inflato 4-lobo. *Lindl. in Bot. Reg. sub. t.* 32; *Hook. f. Fl. Brit. Ind.* vi. 72. Sarcanthus densiflorus, *Par. et Reichb. f. in Trans. Linn. Soc.* xxx. 136. Saccolabium densiflorum, *Lindl. in Wall. Cat. n.* 7311 *et Gen. and Sp. Orchid*, 220 *et in Bot. Reg.*, 1838, *Misc.* 56. Aerides densiflorum, *Wall. mss.*

HAB.—BHOTAN (*Ic. in Herb. Calcutta*). TENASSERIM, Moulmein, *Parish*. PENANG, *Wallich*, *Curtis*. PERAK, *Kunstler*. DISTRIB. Borneo.

Stem variable in thickness, as thick as the middle finger in the Penang and figured specimens, more slender in the Tenasserim and Perak ones, flexuous, apparently scandent;

roots very long and stout; internodes green, ½—1 in. long. *Leaves* 4—8 by ½—2 in., spreading and waved, deeply channelled, dark green. *Peduncle* 1—2 in., stout, green, with broad ovate obtuse sheaths ¼ in. long, the lowest of which are annular; spike 4—5 in., dense-fld., glabrous or faintly furfuraceous; bracts nearly as long as the short ovary; flowers ⅛ in. broad in Penang specimen, ¼ in. in the Bhotan drawing. *Sepals* and *petals* widely spreading. *Lip* about as long as the sepals, yellowish, flushed with red, dorsal callus erect forked; spur almost bottle-shaped, the inflated truncate end 2-lobed and each lobe again faintly lobulate, sometimes transversely septate near the base within. *Column* very short and stout, rostellum obscure. *Anther* flat, ovate, acuminate; pollinia globose; strap very slender, dilated above; gland small.

A very stout species as figured here, remarkable for the bottle-shaped spur of the lip, which resembles that of *Saccolabium buccosum*, Reichb. f. I have some doubts as to whether there may not be two species included under *C. spicatum*, and that the Sikkim plant (of which I have seen no specimen) figured here may be different from the Tenasserim and Penang one, the flowers are so much larger; allowance, however, must be made for the habitual exaggeration of native artists. On the other hand, the Sikkim habitat may not be a correct one, the transposition of labels of garden plants is so frequent and not detectable. The drawing is inscribed "Sarcanthus latifolius, T. Anders., from B. G., 26th April 1866, introd. by S. Jennings, Esq., from Bhotan. T. Anders." Another drawing of a plant with narrower leaves is inscribed "From Perak, Kunstler misit, H. B. C. fld. 23-5-84."

Fig. 1, flower with the sepals and petals displaced; 2 and 3, anther; 4, pollinia:—*all enlarged.*

PLATE 84.

CLEISOSTOMA UTERIFERUM, *Hook. f.*

C. uteriferum; acaule, foliis paucis late loriformibus flaccidis apice oblique rotundatis v. 2-fidis marginibus undulatis, pedunculo rachique spicæ densifloræ striato crasso foliis breviore, bracteis minutis, floribus parvis, sepalis obovato-oblongis petalisque angustioribus lineari-oblongis flavis basin versus fusco-rubris, marginibus undulatis, labelli ore constricto lobis lateralibus brevibus truncatis, terminali minuto ovato carnoso, calcare magno globoso inflato antice sulcato. *Hook. f. Fl. Brit. Ind.* vi. 74.

HAB.—PERAK, *Kunstler* (*in Herb. Calcutt.*).

Stem very short, with tufted roots. *Leaves* pendulous or decurved, flat, rather pale green, base hardly contracted, tip sometimes obliquely truncate. *Spike* with peduncle 3½ in.; flowers about ¼ in. diam.; ovary about $\frac{1}{12}$ in. *Sepals* and *petals* fleshy. *Lip* almost wholly consisting of the globose bottle-like spur with thin walls; it bears a small callus under the minute caruncled midlobe, and a large erect tongue-like one below the column. *Column* very short and stout, rostellum short, protruded. *Anther* broad, truncate, crown 2-lobed, 1-celled; pollinia globose, strap elliptic-lanceolate, narrowed at both ends, gland oblong.

A very well marked species, of which I have seen only dried flowers accompanying the drawing, which is inscribed "Kunstler e Perak misit., Fl. in H. B. C., 14-6-84."

Fig. 1, side and 2, front view of flower; 3, section of lip; 4, column and portion of sac of lip with dorsal callus; 5, anther; 6, pollinia:—*all enlarged.*

PLATE 85.

CLEISOSTOMA WENDLANDORUM, *Reichb. f.* ?

C. Wendlandorum; acaule, foliis elongatis late loriformibus oblique 2-lobis recurvis v. pendulis flaccidis, racemo brevi foliis multoties breviore simplici v. paniculatim ramoso, pedunculo brevi ramisque validis, floribus minutis flavis, labello rubro suffuso, sepalis obovato-oblongis, petalis obovatis, labelli lobis lateralibus brevibus rotundatis, terminali orbiculari v. late ovato-rotundato, calcare sacciforme inflato basi rotundato. *Reichb. f. in Otto & Dietr. Algem. Gartenzeit*, 1856, 219; *Hook. f. Fl. Brit. Ind.* vi. 74. C. callosum, *Reichb. f. in Bonplandia (non Blume).* Pomatocalpa spicatum, *Kuhl and Hasselt, ex Reichb. f. in Otto and Dietr. Algem. Gartenzeit. l. c.*

HAB.—CACHAR, *Keenan.* TENASSERIM, *Parish.* ANDAMAN ISDS., *Berkeley.*

Stem, or rather leaf-sheaths, sometimes 1—1½ in., as broad as the middle finger, green with brownish markings; roots basal, fascicled. *Leaves* 6—10 by 1—1½ in., coriaceous, bright green, flat and faintly channelled above, with a slender keel beneath. *Raceme* or *panicle* 4—6 in.; peduncle and rachis green speckled with brown; bracts obscure; ovaries about ⅙ in.; flowers about $\frac{1}{10}$ in. diam., papillose. *Lip* about as long as the sepals; mouth contracted; spur short, broad, almost truncate, dorsal callus a semicircular erose scale, that under the midlobe of the lip 2-lobed; midlobe rough. *Column* very short, rostellum beaked. *Anther* broad; pollinia globose; strap narrowly linear, gland small. *Capsule* (in Cachar specimen) 1 in., linear-oblong.

If there be not more than one species included under *C. Wendlandorum*, this must be a common and variable species. There are several drawings in the Kew and Calcutta Herbaria of what I take to be the same.

The figures 1A and 1B of the flower and lip are taken from Tenasserim specimens collected by Parish, authentically named by Reichenbach.

Fig. 1, flower-bud; 2, flower; 3, the same with the petals and sepals displaced; 4, anther; 5, pollinia. A1, flower, A2, lip laid open:—*all enlarged.*

PLATE 86.

CLEISOSTOMA MANNII, *Reichb. f.*

C. Mannii; caule brevi, foliis breviusculis loratis v. lineari-oblongis apicem versus dimidiato-bilobis crasse coriaceis, pedunculo robusto simplici v. parce ramoso, spica breviuscula multiflora, rachi crassa subclavata, bracteis minutis, floribus parvis, sepalis petalisque obovatis aureis, labelli lobis lateralibus truncatis abbreviatis terminali orbiculari-ovato lilacino, calcare brevi sacciforme apice subinflato rotundato, callo infra columnam bifido. *Reichb. f. in Flora*, 1872, 273; *Hook. f. Fl. Brit. Ind.* vi. 74.

HAB.—ASSAM, *Mann.* SIKKIM ? (*Ic. in Herb., Calcutta*).

Stem 1—1½ in., as thick as a swan's quill, rooting at the base. *Leaves* few, 3 by ½—⅔ in., striate, very coriaceous, rather narrowed towards the base, produced at one side into a rounded point, the other side shorter and very obliquely truncate, very coriaceous, dark-green; sheaths very short. *Peduncle* about as long as the spike,

green, striate; bracts minute, ovate, brown; ovaries about $\frac{1}{6}$ in.; flowers $\frac{1}{10}$—$\frac{1}{6}$ in. diam. *Sepals* flushed with purplish red. *Lip* about as long as the sepals, yellow except the midlobe. *Column* very short and stout. *Anther* broad, obtuse; strap rather long, slender, dilated upwards, gland small.

I have seen no specimens of the plant here figured, or of Reichenbach's *C. Mannii*, and cannot hence speak confidently of their identity. As a species it approaches *C. Wendlandorum* most closely, but is very much smaller, with shorter strict stiff apparently very coriacious leaves, narrowed towards the one-sided obtuse tip. The lip is identical with that of the above-mentioned species, except that the scale or callus below the column is bifid or acutely 2-toothed. It is also closely allied to *C. undulatum*, which has a bifid scale, but the leaves are very much shorter, not undulated, the spur is not globose, and the midlobe of the lip apparently not caruncled.

The drawing here reproduced is inscribed "? Sikkim fld. Bot. Garden, Calc. March 1875."

Fig. 1, flower; 2, column and lip; 3, lip seen from above; 4, anther; 5, pollinia:—*all enlarged.*

PLATE 87.

Cleisostoma bicuspidatum, *Hook. f.*

C. bicuspidatum; caule brevi, foliis ascendentibus late loriformibus profunde acute bifidis lobis sapius intus unidentatis, pedunculo gracile e basi caulis ascendente foliis longiore v. breviore simplici v. parce racemifero, racemis apice decurvis laxe pauci-v. multi-floris, floribus majusculis, sepalis petalisque oblongis subacutis flavo-virescentibus nervo medio roseo, labelli albi roseo picti lobis lateralibus majusculis rotundatis v. retusis terminali brevi crasso ovato incurvo, calcare sepalis longiore conico-cylindraceo obtuso, callis ad basin lobi terminalis et infra columnam 2-fidis pubescentibus. *Hook. f. Fl. Brit. Ind.* vi. 75.

Hab.—Sikkim Himalaya, near Darjeeling, *Anderson* (*in Herb. Calcutta*). Khasia Hills, alt. 2,000 ft., *Mann.* Tenasserim, *Parish.*

Stem stout, 2—3 in., rooting at the base, clothed with the green gaping sheaths of the leaves. *Leaves* rather numerous, distichous, 3—6 by $\frac{1}{2}$—1 in., flat, striate, midrib slender, bright green, not keeled. *Peduncle* sometimes 8 in. long, and exceeding the leaves, green, speckled with red; sheaths short, amplexicaul, brown; bracts minute; racemes sometimes 6 in. long; pedicel with ovary $\frac{1}{4}$ in.; flowers $\frac{1}{2}$—$\frac{3}{4}$ in. broad. *Sepals* and *petals* spreading or reflexed, 1-nerved, rather membranous. *Column* short, stout, rostellum long beaked. *Anther* flat, lanceolate, beak long or short; pollinia globose, cleft, seated below the rounded apex of the strap, which is rather long and dilated upwards.

I have vainly endeavoured to identify this apparently rather widely distributed and very distinct species with any described by Reichenbach. There are several drawings of it in Herbs. Kew and Calcutta, presenting a good deal of variety in the flowers, but very uniform in habit and in the remarkable broadly acutely bifid flat leaves. Of those in the Calcutta Herb., that here reproduced is inscribed "Parish Orchid, 8-5-66, Fld. 20th July 1869." It has a short anther. Figures A1, 2, 3 are from another drawing, marked "Aerides of Moulmein." It has a very long anther. A third drawing, representing a specimen with narrower leaves and smaller flowers, has a shorter stem with broader sepals

and petals and a hemispheric midlobe of the lip: it is inscribed "near Darjeeling, July 1862. T. Anders." The anther of this is intermediate in length between those of the two former.

The figs. B1 and B2 are from Mann's Khasian specimens.

Fig. 1, flower; 2, the same with the sepals and petals displaced and lip (fig. 3) removed; 4, anther; 5, pollinia from the specimen figured:—*all enlarged.* A1, lip; A2, anther; A3, pollinia, all from the Moulmein drawing and *all enlarged.* B1, column and B2, lip laid open; both *enlarged* from a Khasian specimen.

PLATE 88.

HERPYSMA LONGICAULIS, *Lindl.*

H. longicaulis, Lindl. Stem 6—12 in., robust, elongate and creeping and rooting below, then ascending, as thick as a swan's quill or less, clothed below with white membranous truncate pubescent sheaths, leafy above. *Leaves* 2—3 in., ovate-lanceolate or elliptic, acuminate, narrowed into a short petiole, membranous, bright green, paler beneath; sheaths appressed to the stem, lower $\frac{1}{4}$, upper $1\frac{1}{2}$ in., striate, pale green. *Raceme* or *spike* terminal, sessile, many-fld.; bracts longer than the ovary, very large, broadly ovate, obtuse, membranous, pale brown, striate; pedicels short, with the pubescent ovary $\frac{1}{2}$—$\frac{2}{3}$ in. long, suberect; flowers $\frac{1}{2}$—$\frac{2}{3}$ in. long, white or pale pink, or white tipped with red. *Sepals* puberulous, subequal, ovate-oblong, acute, free, dorsal forming a hood with the shorter, broader, obtuse petals. *Lip* shorter than the petals, adnate to the sides of the column, subpanduriform, reflexed from the middle, strongly 5-nerved, disk with two flattish calli about the middle and a thick lamella extending to the rounded tip; spur longer than the blade, straight, inflated above, slender below, striate, longitudinally grooved and infolded at the back, tip rounded and notched. *Column* short, white, contracted below the broad pulvinate central stigma, without appendages in front; rostellum short, erect at length bifid. *Anther* sessile, erect, linear-oblong, 2-celled; pollinia narrow, tipped with hard lanceolate appendages, pollen-grains flattened. *In Wall. Cat.* n. 7389; *et in Bot. Reg. sub. t.* 1618; *Gen. and Sp. Orchid.* 506 *et in Journ. Linn. Soc.* i., 178, 190; *Hook. f. Fl. Brit. Ind.* vi. 98.

HAB.—EASTERN SUBTROPICAL HIMALAYA; Nepal, *Wallich*; Sikkim, alt. 3—4,000 ft., J. D. H., &c. KHASIA HILLS, alt. 4,500 ft., *Clarke.*

There is no inscription on the drawing, which is no doubt from a plant that flowered in the Royal Garden, Calcutta.

Fig. 1, side, and 2, front view of flower; 3, flower with one lateral sepal and petal removed:—*all enlarged.*

PLATE 89.

ODONTOCHILUS LANCEOLATUS, *Benth.*

O. lanceolatus; caule pedali flexuoso, foliis 2—3-pollicaribus ovato-lanceolatis acutis v. acuminatis, spica breviter pedunculata multiflora pubescente, bracteis lanceolatis ovarium glabrum aequantibus v. excedentibus, floribus glabris, labelli aurei ungue lata utrinque ectinata dentibus 3—6, lobis terminalibus oblongo-quadratis, sacco globoso didymo, polliniis globoso-ovoideis. *Benth. in Gen. Plant.* iii. 598; *Hook. f. Fl. Brit. Ind.* iii. 101.

O. flavus (*errore pro* luteus), *Benth. l.c.* Anœctochilus lanceolatus, *Lindl. Gen. et sp. Orchid.* 499 *et in Journ. Linn. Soc.* i., 179. A. luteus, *Lindl. in Journ. Linn. Soc. l. c.*

HAB.—SIKKIM HIMALAYA and the KHASIA Hills, alt. 5—6,000 ft., common; *Griffith*, &c. (*Kew distrib., n.* 5,352, 5,354).

Stem with spike 6—12 in., stout or slender, few or many-leaved, often extensively creeping, then ascending and flexuous. *Leaves* bright green, paler beneath; petiole $\frac{1}{4}$—$\frac{1}{2}$ in.; sheath short. *Spike* 2—3 in.; bracts $\frac{1}{3}$—$\frac{1}{2}$ in., pale, nearly glabrous. *Lateral sepals* $\frac{1}{4}$ in., ovate, obtuse, green or purplish, 1-nerved, *dorsal* and *petals* cohering in an obtuse hood broader than long. *Lip* many times longer than the sepals; claw not dilated at the base, limb $\frac{1}{3}$ in. diam.; sac with a pair of curved spurs within. *Column* very short indeed, frontal appendages obscure; rostellum broad, bicuspidate. *Anther* shortly ovate, beaked; pollen grains cuneiform.

After an examination of numerous specimens for the Flora of British India, I concluded that *Odontochilus lanceolatus* and *O. luteus* (Anœctochilus, *Lindl.*) were one and the same species, and the figure here given tends to confirm this opinion, for it agrees with the characters given to both. It is, however, very much larger than the usual form of the plant, no doubt due to the habit of enlargement to which native artists are prone; and it differs from the description in the Flora of British India, in the violet-purple colour of the sepals and petals and in the more numerous divisions of the claw of the lip and rather narrower terminal segments,—all variable characters. The size of the flower appears also to be extremely variable.

The drawing is inscribed "Tonglo, near Darjeeling, August 1862," in Dr. Anderson's hand-writing.

Fig. 1, front, and 2 back view of flower; 3 and 4, anther; 5, pollinia:—*all enlarged.*

PLATE 90.

ZEUXINE (*Monochilus*) GOODYERIOIDES, *Lindl.*

Z. goodyerioides; scapigera, foliis subsessilibus ovatis saturate viridibus costa media pallida, spica glabra v. puberula, bracteis ovarium glabrum æquantibus, labelli hypochilio cymbiforme, epichilio parvulo orbiculari v. oblongo concavo membranaceo. *Lindl. Gen. and Sp. Orchid.*, 486; *Hook. f. Fl. Brit. Ind.* vi. 107.

HAB.—Temperate EASTERN HIMALAYA, from Sikkim to the Mishmi Hills, alt. 6—8,000 ft. PEGU, *Kurz*; (*in Herb. Calcutta*).

Stem 6—8 in., from a long creeping rooting base. *Leaves* 1—1$\frac{1}{2}$ in., sessile or shortly petioled, obtuse acute or acuminate, dark green, paler beneath; sheaths short, coloured. *Scape* 3—6 in., slender, glabrous or pubescent with reversed hairs; sheaths 2—3, with coloured tips lanceolate. *Spike* 1—2 in., few and lax-fld.; bracts $\frac{1}{4}$ in. long, lanceolate, brown. *Sepals* $\frac{1}{5}$ in. long, lateral lanceolate, 1-nerved, green; dorsal ovate, acute, brownish red; petals falcate, very obtuse. *Lip* wholly included, hypochil coriaceous, 2-calcarate within. *Column* short, rostellar arms short; stigmatic lobes distant; pollinia pyriform, caudicle slender, gland oblong. *Capsule* $\frac{1}{2}$ in., fusiform.

The drawing is inscribed "Sikkim, 6,000 ft., September 1876. G. King."

Figs. 1 and 2, flowers and bract; 3, flower with three perianth segments displaced; 4, bract, ovary and column; 5, lip; 6 and 7, anther; 8, pollinia:—*all enlarged.*

PLATE 91.

Goodyera foliosa, *Benth.*

G. foliosa; caule basi longe decumbente radicante, dein ascendente folioso, foliis petiolatis ovato-lanceolatis acuminatis, spica breviter pedunculata glanduloso-pubescente, bracteis lineari-lanceolatis flores secundos roseos longe superantibus, sepalis 3-nerviis ovatis v. ovato-lanceolatis, petalis dimidiato-oblongis 1-nerviis labello oblongo saccato intus crebre setoso, rostelli ramis elongatis, anthera lanceolata. G. foliosa, *Benth. in Herb. Kew*; *Hook. f. Fl. Brit. Ind.* vi. 113. Georchis foliosa, *Lindl. Gen. and Sp. Orchid.*, 496. G. secundiflora, *Griff. Notul.* iii. 393 (*excl. Ic.*).—Goodyeræ, *sp. Griff. It. Notes* 36, *No.* 591, *Notul.* iii, 396, *No.* 11 *et Ic. Pl. Asiat.*, 346 *f.* i.

Hab.—Temperate Sikkim Himalaya, alt. 5—7,000 ft. Assam, the Khasia and Naga Hills, ascending to 5,000 ft. Burma, *Griffith.* Perak., alt 7,000 ft., *Wray.*

Stem 6—12 in., rather slender. *Leaves* 1½—2½ inches, oblique, dark green, 3—5-nerved, not reticulately veined; petiole ⅓—⅔ in.; sheath short. *Spike* 2—3 in.; bracts ½—⅝ in., erect, glabrous or puberulous; flowers pale pink. *Lip* included, with a rather dilated recurved rounded tip beyond the sac. *Column* very short; rostellum longer than its body; stigma broad. *Anther* ovate-lanceolate, long-beaked; pollinia clavate, bipartite, united at the base and produced into a slender strap.

A very distinct species, resembling in the leafy stem *G. vittata*, also a native of Sikkim, which has fleshy dark green leaves with white nerves, a glabrous spike, much shorter bracts, and a long-pointed lip.

The drawing here reproduced is inscribed "Below Buchim, Sikkim, 7,000 ft., October 1862," in Dr. Anderson's handwriting. The lateral sepals are represented as acuminate, which they are not in the examples I examined.

Fig. 1, bract and flower; 2, flower with the sepals and petals displaced; 3, ovary, column, and lip; 4, lip; 5, column; 6, anther; 7, pollinia :—*all enlarged.*

PLATE 92.

Goodyera vittata, *Benth.*

G. vittata; glaberrima, robusta, caule folioso, foliis ovatis acutis crassiusculis saturate viridibus nervis nervulisque albis, subtus purpurascentibus, bracteis lanceolatis flores secundos roseos aequantibus, sepalis ovatis acuminatis, petalis oblanceolatis falcatis 3-nerviis, labello basi saccato 7-nervi apice longe producto apicem versus 2-lamellato, sacco intus setoso, rostelli ramis elongatis. G. vittata, *Benth. in Herb. Kew*; *Hook. f. Fl. Brit. Ind.* vi. 113. Georchis vittata, *Lindl. in Journ. Linn. Soc.* i. 184.

Hab.—Temperate, Sikkim Himalaya, alt. 6—9,000 ft., J. D. H., &c.

Stem 4—6 in., leafy nearly up to the spike. *Leaves* 1½—3 in.; petiole very short or o.; sheaths short, membranous, coloured. *Spike* 2—4 in.; peduncle short, clothed with imbricating lanceolate finely acuminate green and reddish sheaths that pass into bracts. *Sepals* ½ in. long, tips recurved. *Lip* rather longer than the sepals, gradually contracted beyond the sac into the subrecurved oblong-lanceolate acute blade. *Column* very short. *Anther*

ovate-lanceolate; pollinia narrowly pyriform, united at the base into a very short slender stipe or strap seated on a narrowly linear gland.

The drawing from which the plate is produced is inscribed "Tonglo, near Darjeeling, 10,000 ft. above the sea, 2nd August 1862, T. Anders."

Fig. 1, flower; 2, the same, with the sepals and petals removed; 3, ovary and column; 4, anther; 5, pollinia:—*all enlarged.*

PLATE 93.

POGONIA SCOTTII, *Reichb. f.*

P. Scottii; elata, glaberrima, folio longe petiolato amplo late reniforme apiculato multinervi, scapo valido sulcato, racemo erecto multifloro, bracteis ovario æquilongis v. longioribus lineari-lanceolatis deflexis, sepalis petalisque lineari-lanceolatis acuminatis viridibus rubro-striatis, labello sepalis æquilongo subunguiculato ima basi saccato obovato spathulato albo rubro striato ultra mediam 3-lobo, lobis lateralibus brevibus obtusis terminali suborbiculari velutino. *Reichb. f. in Flora*, 1872, 276; *Hook. f. Fl. Brit. Ind.* vi, 120.—? Pogonia No. 2, *Griff. Notul.* iii. 377 *et Ic. Pl. Asiat. t.* 345.

HAB.—SIKKIM HIMALAYA; Darjeeling (*fide Reichb. f.*). CHITTAGONG, at Sitakoond (*Ic. in. Herb. Calcutta*). Burma? *Griffith.*

Leaf 8—10 in. diam., dark green, with about 20 principal folds, and many interposed nerves, bright green above; petiole 12 in., acutely ribbed, green above, red-purple below the middle. *Scape* about as long as the petiole, dark-brown below and as thick as a goose-quill, more slender, green, and acutely ribbed above; sheaths few, 1—1½ in., cymbiform; raceme strict, 4—6 in. long, rachis angled; bracts ½—⅔ in., green, very slender; pedicels with ovary ½ in., decurved; flowers ⅔ in. long, horizontal. *Sepals* and *petals* connivent. *Column* dorsally hairy at the tip.

A noble species, much the largest hitherto known, discovered, I believe, by Mr. Scott near Chittagong when Curator of the Calcutta Botanic Garden, and after whom Reichenbach named it. I do not know on what authority the latter author gives Sikkim as its native country, though it is a very likely one. Lindley refers the Burmese plant of Griffith to *P. carinata*, but the saccate base of the lip and flowers placed at an angle with the ovary rather indicate *P. Scottii.* Their characters are, however, not shown in Griffith's figure.

The drawing here reproduced is inscribed "Pogonia nobilis, *Scott.* Pogonia of Seetakoond hill, introd. 1866, figd. June 1868."

Fig. 1, flower; 2, the same with the sepals and petals displaced and the lip (fig. 3) removed; 4, anther; 5, pollinia:—*all enlarged.*

PLATE 94.

POGONIA CARINATA, *Lindl.*

P. carinata, glaberrima, folio orbiculari-cordato acuto 7—12-nervi, scapo foliis longiore teretiusculo, racemo erecto sparsifloro, bracteis linearibus ovariis multo longioribus, pedicellis brevibus, sepalis petalisque patentibus anguste linearibus oblanceolatisve acuminatis viridibus, labello sepalis æquilongo basi non saccato ad medium 3-lobo

cuneato-obovato vix unguiculato, lobis lateralibus parvis rotundatis constrictis, terminali latiore late ovato acuto crenulato, disco pubescente. *Lindl. Gen. and Sp. Orchid.* 414 *et* in *Journ. Linn. Soc.* iii. 45 (*excl. syn. Griffith*); *Hook. f. Fl. Brit. Ind.* vi, 121. ? *Dalz.* and *Gibs. Bomb. Fl.* 270. Epipactis carinata, *Roxb. Hort. Beng.* 53 *et Fl. Ind.* iii, 452.

HAB.—Plains of INDIA, from Rohilcund to Lower Bengal and the Deccan Peninsula. PEGU, *Kurz.*

Tuber globose, the size of a marble, annulate. *Leaf* 1½—2½ in. diam., dark green, not waved, but plicate; petiole 2—4 in., striate, passing below into a long, erect rhizome, with horizontal roots and suckers; at the junction of the petiole and rhizome is a lanceolate sheath. *Scape* 8—12 in., slender, terete, with appressed tubular basal sheaths; raceme many or few-fld.; bracts ½—⅔ in. long, spreading, green; pedicels about ⅛ in.; ovary longer, turbinate; sepals ⅔ in. long, and rather narrowed; petals greenish; lip pink.

I am pretty certain that this is Lindley's *P. carinata.* On the drawing it is named "*P. plicata*, Lindl. fld. in. H. B. C. in pots, April 1861, T. Anders.," which it certainly is not, that species being only 1—3-fld., and having hairy leaves and small bracts. The column is, however, similarly deeply 2-lobed at the tip, and the long surculi proceeding from the downward prolongation from the base of the petiole are no doubt of the same nature as the tuberiferous ones of *P. plicata.* The Indian Pogonias are very imperfectly known, and being of an extremely delicate consistence, it is only from very carefully preserved specimens or drawings that characters of any value can be drawn.

Fig. 1, flower; 2, ovary and lip; 3 and 4, ovary and column; 5, 6, and 7, anther; 8, pollinia:—*all enlarged.*

PLATE 95.

HABENARIA (*Ate*) DIGITATA, *Lindl.*

H. digitata; foliis ovatis v. ovato-oblongis, racemo multifloro, floribus viridibus, bracteis elongatis inferioribus foliaceis ovario longioribus, sepalis patentibus, lateralibus ovatis acutis, dorsali suborbiculari, petalis bipartitis segmentis linearibus falcatis, labelli tripartiti segmentis linearibus acutis lateralibus terminali longioribus v. brevioribus, calcare ovario æquilongo aequali v. apice clavato, antherarum loculis pendulis tubis brevibus incurvis, rostello triangulari erecto. *Dalz. and Gibs. Bomb. Fl.* 267; *Hook. f. Fl. Brit. Ind.* vi. 134. H. trinerve, *Wight.* Ic. t. 1701. Bonatea punduana, *Lindl. in Wall. Cat.* n. 7063. B. benghalensis, *Griff. in Calc. Journ. Nat. Hist.* iv. 382. B. herbacea, *Wall. mss.*

HAB.—KASHMIR, *Falconer.* SIKKIM, alt. 7,000 ft., *King.* (*Ic. in Herb. Calcutta*). ASSAM, *Simons.* SILHET, *Wallich.* BENGAL, *Griffith.* TENASSERIM, *Parish.* WESTERN GHATS, from the Concan Southwards.

Stem 1—2 ft. from an oblong tuber, leafy chiefly towards the middle. *Leaves* 2—5 in. long, very variable in breadth, from orbicular to almost oblong-lanceolate, acute or acuminate, rarely narrowed into a petiole. *Raceme* 3—5 in.; bracts large, often almost foliaceous, and exceeding the flowers; pedicels very short; flowers ½—⅔ in. diam. Segments of *petals* very variable in length, sinus between them narrowed or rounded. *Spur* with

an erect ligule at the mouth. *Stigmatic processes* clavate. *Pollinia* with minute glands. *Capsule* shortly pedicelled, $\frac{1}{2}$ in. long, fusiform, ribs thick.

A very common, widely diffused Indian species, and consequently very variable in stature, foliaceous habit and size of the flowers. Forms which I have included under var. *foliosa*, and which ascend to 8,000 feet in the Nilghiris, are very leafy, but shorter, with denser flowers, shorter bracts and filiform segments of the lip: to it are referable *H. foliosa*, A. Rich., *H. laciniata*, Dalz., *Platanthera marginata*, Wall., and *Orchis mysorensis*, Heyne.

The specimen here figured is noted on the drawing as from "near Darjeeling, October 1877. G. King." It represents a plant nearly twice as large as any of the specimens of the species that I have seen.

Fig. 1, bract and flower-bud; 2, flower; 3, flower with petals removed?; 4, flower with sepals and petals removed; 5, side view of flower; 4, pollinia:—*all enlarged.*

PLATE 96.

HABENARIA (*Ate*) STENOPETALA, Lindl. *Var.* polytricha.

H. stenopetala, Lindl. Gen. and sp. Orchid. 319 (not 324); Hook. f. Fl. Brit. Ind. vi. 134.

Var. polytricha; bracteis flores excedentibus, racemo brevi densifloro, sepalis in aristas capillaceas lamina multo longiores productis, petalorum cruribus patentibus æquilongis setaceis, labelli lobis filiformibus incurvis.

HAB.—SIKKIM HIMALAYA, at Choongtam, alt. 6,000 ft., J. D. H. NAGA HILLS, *Prain.*

Differs from the ordinary form of *H. stenopetala* in the exaggerated length and capillary slenderness of the apices of the sepals, and segments of the lip and of the petals.

The drawing is made from a dried specimen ticketed "Naga Hills, No. 79, Jotsuma. Dr. D. Prain, 1886," which was lent me by Dr. King from the Calcutta Herbarium. The same form or nearly approaching it is found in Sikkim.

PLATE 97.

HABENARIA (*Platyglossa*) ARIETINA, *Hook. f.*

H. arietina; caule elato robusto folioso, foliis ovato-lanceolatis acuminatis amplexicaulibus subtus valide costatis, racemo elongato multifloro; bracteis ovato-lanceolatis, inferioribus foliaceis ovariis longioribus, superioribus brevioribus cymbiformibus acuminatis; floribus amplis virescentibus, sepalis lateralibus ovato-lanceolatis acuminatis, dorsali cum petalis falcatis basi gibbosis pubescentibus in galeam latam cohœrentibus, labelli 3-partiti segmentis lateralibus extus pectinatis intermedio lineari. *Hook. f. Fl. Brit. Ind.* vi. 138. H. pectinata, *Lindl. Gen. and Sp. Orchid.* 341 (*non. Don.*); *Wall., Cat.* 7029 *B* (*in* part), C.

HAB.—TEMPERATE HIMALAYA; from Simla, alt. 5—8,000 ft., eastward to Sikkim, ascending to 10,000 ft. KHASIA HILLS, alt. 5—6,000 ft.

Tuber oblong. *Stem* 1—2 ft. and upwards, often as thick as a swan's quill below, grooved, stiff. *Leaves* 4—6 in., 5-nerved, tip usually curved. *Raceme* 6—10 in., laxly many-fld.; lower bracts 2 in., much longer than the ovary, upper half not longer than

the pedicel, which with the ovary is 1—2 in. long; flowers 2 in. diam. or less. *Sepals* and *petals* variable in breadth, widely spreading. *Lip* with the lateral lobes slender, falcate, pectinate with long cilia on the outer margin; spur $\frac{1}{2}$—$\frac{2}{3}$ in., slender. *Anther* short, broad, cells rather incurved, their short tubes upcurved towards the face of the anther-cells or outwards; pollinia linear, about as long as their caudicles or shorter; rostellum confluent with the face of the column, stigmatic processes elongate falcate.

Closely allied to *H. pectinata*, Don., and taken for it by Lindley, who, as observed in the Flora of British India, gave the latter plant the name of *H. ensifolia*. It differs from *H. pectinata* in the much broader and very gibbous pubescent petals, and in the longer lip. They may prove to be varieties, for they inhabit the same mountains and at about the same elevation, but, as hitherto observed, apparently keeping their characters. The closely allied *H. intermedia*, Don., also of the temperate Himalaya, differs in the glabrous petals and long stout spur.

The specimen figured was collected in Sikkim, "Darjeeling, 16th April 1876, G. King."

Fig. 1, flower; 2, ovary, column, and lip; 3, dorsal and 4, lateral sepals; 5, petals; 6, pollinia:—*all enlarged.*

PLATE 98.

HABENARIA (*Platyglossa*) GENICULATA, *Don.*

H. geniculata; caule elato folioso superne vaginis foliaceis elongatis involuto, foliis sessilibus ellipticis oblongo-lanceolatisve acutis 5—7-nerviis, spica oblonga pauci-v. multi-flora, bracteis ovario fusiformi rostrato paullo brevioribus lanceolatis acuminatis, sepalis late ovatis acutis, petalis lineari-oblongis; labello orbiculari v. lato obcordato, lobis lateralibus latis semi-orbiculatis v. dimidiato-cuneatis crenatis v. fimbriatis, intermedio minuto, calcare gracili ovario multo longiore medio geniculato. *Don Fl. Nep. Prodr.* 25; *Hook. f. Fl. Brit. Ind.* vi. 138. Platanthera geniculata, *Lindl. in Wall. Cat. n.* 7042.—Habenaria, *Griff. Notul.* iii. 406, *Itin. Notes*, 31, No. 494 *et Ic. Pl. Asiat. t.* 340.

HAB.—SUBTROPICAL HIMALAYA, from Nepal eastwards. KHASIA and NAGA HILLS, alt. 2—5,000 ft. BURMA, *Wallich.*

Stem 1—3 ft., stout or slender. *Leaves* 2—6 in., sheaths long. *Spike* 6—10 in. long, 4—50 fld.; bracts $\frac{3}{4}$—1$\frac{1}{2}$ in., green, peristent; ovary narrowly fusiform, slightly decurved at the tip, thickly ribbed; flowers $\frac{3}{4}$—1 in. broad. *Sepals* variable in breadth, greenish-white; petals much shorter and narrower, white. *Lip* white, very variable in breadth, often $\frac{3}{4}$ in. broad, sometimes orbicular with the very small entire yellow ovate mid-segment in a terminal notch, at others much broader than long, with wing-like side-lobes and a tongue-shaped midlobe, which is hardly longer than the side-lobes; margins of side-lobes erose-crenate or shortly fimbriate; spur much longer than the ovary, kneed above the middle, the lower portion more or less clavate towards the tip. *Anther* broad, cells divaricate, their tubes upcurved; glands of pollinia small; stigmatic processes elongate, clavate, margining the mouth of the spur; rostellum low, broad. *Capsule* 1 in., shortly pedicelled, beaked, deeply grooved and thickly ribbed.

A very fine species, common in the Himalayas at low elevations. The drawing here reproduced is inscribed "Mungpo, Sikkim, 3,500 ft., September-October 1874, G. King."

Figs. 1 and 2, flowers:—*enlarged.*

PLATE 99.

HABENARIA (*Platyglossa*) TRIFLORA, *Don.*?

H. triflora; caule dense folioso, foliis suberectis imbricatis ellipticis acutis in bracteas angustiores foliaceas ovaria superantes transeuntibus, spica brevi dense multiflora, floribus amplis albis, sepalis orbicularibus, petalis minutis linearibus, labello magno sepalis multo majore late obcordato sinu elongato fere clauso, lobis lateralibus semi-orbicularibus v. dimidiato-obovatis integerrimis, terminali lineari lateralibus vix longiore, calcare ovario multo longiore, anthera latissima.

HAB.—unrecorded.

Stem stout, closely invested by the imbricating suberect leaves, probably more than a foot high, the upper part (above figured) 8 in., with the inflorescence. *Leaves* 1½—2 inches, smaller and narrower upwards, and passing into long green lanceolate sheathing bracts an inch long and more, from amongst which the perianth with its spur alone protrudes. *Spike* densely-fld., probably elongating to several inches; ovaries 1 in., not beaked; flowers 1 in. broad, pure white. *Sepals* incurved, 5-nerved, the outer pair with branching nervules towards the margin; petals 1-nerved. *Lip* as broad as the rest of the flower, cleft nearly to the base into two very broad lobes, with a slender inter mediate lobe and 2 calli at the base; spur slender, green, much longer than the ovary, slightly curved. *Anther* very large and broad, cells marginal incurved; rostellum apparently a minute tooth on the broad face of the column.

I have been much exercised in my mind about the drawing here reproduced, which represents a remarkably fine plant, unfortunately with no note of locality or collector, but presumably one that flowered in the Calcutta Botanic Garden. At first I was disposed to consider it a many-flowered gigantic state of the Himalayan *H. triflora*, Don., which has similarly short, often imbricating leaves, long bracts, erect flowers, small narrow petals, a large broad lip with two basal calli, very long spur, and broad anther; but in that species the lateral sepals are narrow and erect, the flowers 1—3 only, and the side lobes of the lip crenulate. There is no other species to which this is at all nearly allied; and, considering the danger of constituting new species on drawings, especially on those of native artists', it appears to me the best course to refer it doubtfully to *H. triflora*, with which it agrees in the bracts, large flowers, small linear petals, the spur, approximately in the shape of the lip, and especially in the broad anther.

Fig. 1, front and 2, back views of flower; 3, the same with the perianth-segments displaced; 4, lip; 5, pollinia:—*all enlarged.*

PLATE 100.

HABENARIA (*Hologlossa*) LATILABRIS, *Hook. f.*

H. latilabris; caule sæpius elato, foliis sessilibus late obovato-v. elliptico-oblongis acuminatis, spica multiflora, bracteis herbaceis inferioribus floribus longioribus superioribus ovario æquilongis, floribus flavo-viridibus, sepalo dorsali late ovato orbiculari v. oblongo, lateralibus reflexis ovatis v. ovato-lanceolatis acutis, petalis polymorphis, labello sepalis longiore integro lineari-lanceolato v. oblongo lateribus reflexis, calcare ovario curvo rostrato multo longiore incurvo. *Hook. f. Fl. Brit. Ind.* vi. 153. Platanthera acuminata,

Lindl. in Wall. Cat. n. 7040; *Gen. and Sp. Orchid.* 289. P. latilabris, *Lindl. Gen. and Sp. l. c.* P. Orchidis, *Wall. Cat.* 7039, B.

HAB.—TEMPERATE HIMALAYA, from Kashmir, alt. 5—10,000 ft., to Sikkim, alt. 7—12,000 ft.. CENTRAL INDIA, *Hope* (*Herb. Clarke*).

Stem 6—18 in., stout or slender, from an elongate horizontal rather fusiform tuber. *Leaves*, lower 3—5 in. about 7-nerved, upper gradually smaller. *Spike* 3—10 in., lax-fld.; bracts lanceolate or the upper ovate-lanceolate (the latter foliaceous); ovary $\frac{1}{3}$—$\frac{1}{2}$ in., often strongly curved to one side, shortly beaked; flowers very variable in size, $\frac{1}{3}$—$\frac{1}{2}$ in. broad. *Sepals* 3—5-nerved, green; petals yellow-green, erect, fleshy, from linear and gibbous on one side to dimidiate-ovate or broadly ovate with the outer base gibbous. *Lip* yellow-green, thick, linear or lanceolate or almost ovate, sides reflexed; spur stout or slender, often upcurved involute or flexuous. *Anther* rather small, broad, cells contiguous without tubes; pollinia pyriform, caudicles short, glands small; stigmatic processes large, subglobose; rostellum short, triangular, obtuse. *Capsule* $\frac{1}{3}$ in., sessile, fusiform, shortly beaked, more or less curved or twisted.

A very common Himalayan species, and most variable. The trivial name is very inappropriate, but that of *acuminata* having been preoccupied for the *Ate acuminata* of Ceylon, the adoption of *latilabris* was imperative according to the current rules of nomenclature. In its narrow lip and petals the form of *latilabris* here figured approaches the *H. stenantha*, Hook. f. of the Sikkim Himalaya, which is a more slender plant with the lateral sepals linear, and so strongly reflexed as to give the flower the appearance of being laterally compressed. The two may probably prove to be varieties of one. The analyses in the accompanying plate are made from different plants; figs. 1 and 2 have lips (as in the whole spike figured) broader even than the common states of *latilabris*, and with reflected sides, whilst that of fig. 3 is extremely narrow, linear and flat, as it is in *H. stenantha*; fig. 6 represents an intermediate form.

In this and allied species the stem springs from the side or top of a long simple or branched sub-cylindric horizontal tuber, which is annually renewed.

The plate is a reproduction of a drawing inscribed "Sikkim, Sinchal, 8,000 ft., Aug. 1876."

Fig. 1, flower and bracts; 2, flower with the dorsal sepal and a petal removed; 3, flower with the perianth-segments displaced; 4, dorsal sepal; 5, petal; 6, lip; 7, pollinia:—*all enlarged.*

PLATE 101.

HABENARIA (*Phyllostachya*) HELFERI, *Hook. f.*

H. Helferi; caule pubescente ad apicem folioso, foliis sessilibus oblongo-lanceolatis acutis v. acuminatis 3-nerviis, floribus paucis solitariis axillaribus cernuis, sepalis falcato-lanceolatis herbaceis, petalis ovato-lanceolatis, labello magno porrecto sepalis duplo longiore integro cymbiforme marginibus recurvis purpureo v. roseo, calcare infundibulari v. inflato ovario breviore apice attenuato, antheræ loculis approximatis parallelis. *Hook. f. Fl. Brit. Ind.* vi. 164. Gymnadenia Helferi, *Reichb. f. in Flora*, 1872, 276 *et in Trans. Linn. Soc.* xxx. 139.

HAB.—KHASIA HILLS, *Simons.* TENASSERIM, at Moulmein, *Helfer, Parish.*

Stem 8—16 in. from an oblong tuber, sheathed below, then leafy to the apex. *Leaves* 4—8 in., spreading and recurved. *Pedicel* with ovary $\frac{3}{4}$ in., pubescent, erect, then decurved. *Sepals* 1 in. long or less, lateral recurved or with recurved acuminate tips;

petals nearly as large, rose-purple. *Lip* rose-purple, neither clawed nor lobed, quite entire, boat-shaped with recurved margins, orbicular when spread out. *Anther* small, obtusely apiculate, cells narrow, tubes very short, straight, close together; pollinia clavate, as long as their winged caudicles; glands rather large, contiguous; stigmatic processes obscure; rostellum small, erect, 3-lobed, fleshy. *Capsule* $\frac{2}{3}$ in. long, sessile, linear-oblong, ribs thick.

H. Helferi belongs to a small section of the genus including *H. galeandra*, Benth, and *H. jantha*, Benth., from both of which it differs in the larger flower and very large, long, funnel-shaped spur. Reichenbach describes the lip as broad or narrow, but it is broad in all the specimens that I have examined.

No native country was given on the drawing here reproduced, only the date, 1855.

Fig. 1, flower; 2, ovary, column, and lip; 3, column and spur; 4, ovary and column; 5 and 6, pollinia:—*all enlarged.*

H. P.—Reg. No. 2868J—360—13-9-95.

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DESCRIPTIONS

OF

NEW AND RARE INDIAN PLANTS.

SOME NEW OR CRITICAL RANUNCULACEÆ FROM INDIA AND ADJACENT REGIONS.—By Paul Brühl.

PLATES 102 TO 128.

Of the Ranunculaceæ figured in plates 102 to 128, only one, *Coptis ospriocarpa*, is an undoubtedly new species. Others are forms sufficiently distinct to claim for them the rank of species of the second order; but the connecting links between them and species already known having been clearly traced, the writer thinks it preferable to emphasize the want of complete independence by enumerating and defining them explicitly as subspecies. Still others, like *Aconitum gymnandrum*, Maxim., or *Adonis brevistyla*, Franchet, themselves discovered comparatively recently, were not known before to occur in the tracts of country which are legitimately included in India as a botanico-geographical region. A fourth group is made up of some species which, from want of material, have been hitherto identified with species to which they undoubtedly do not belong. Finally, some of the plants have been figured here, because they have either never been figured before or, if so and in any case, because they invite, for some reason or other, the special attention of botanists. A connected account of the Indian *Ranunculaceæ* will appear shortly in the *Journal of the Asiatic Society of Bengal*, part ii, as a sequel to the author's *Disputatio de Aquilegia*: it will therefore be sufficient here to refer only to those species which are figured in the accompanying plates, although a number of other species, like those of *Isopyrum* or several species of *Clematis* and *Ranunculus*, would form interesting subjects for discussion. The writer cannot conclude these introductory remarks without alluding to the great disadvantage which he has felt repeatedly whilst engaged in his researches in Himalayan botany which rises from the fact that there are a number of species—*Ranunculus chaerophyllos*, Linn., for instance—the synonymy of which is yet involved in some doubt. These doubts could, most of them, be definitely cleared up, if some of the European botanical societies would undertake the task of forming complete herbaria of the tracts in which such veterans as Caspar Bauhin, Gouan, Guettard, Lespeyres, and others botanized. Finally, two problems may be referred to as worthy of the attention of Indian botanists: the tracing of the connection between the flora of the North-Western Himalaya and that of the Elburz and the Caucasus; and the establishment of the affinities which link the flora of the Central, and still more that of the Eastern Himalaya, to that of Japan. The obstacles in the way of a satisfactory solution of these problems are the scarcity of Caucasian,

Turkestani, and Japanese specimens in the Indian herbaria; the incompleteness of our knowledge of the floras of Persia, Afghanistan, and some parts of Turkestan; and our practically complete ignorance of the botany of the extreme Eastern Himalaya. The results of the partial exploration of the Chumbi Valley, which very clearly indicate the close relationship of the flora of the Himalayas east of Sikkim to the Floras of Yunnan, Hupeh, Setchwan, and Kansu, point to a rich harvest which is ready to be gathered in the inhospitable regions which stretch from the eastern frontier of Sikkim to the haunts of the Mishmis and Abors.

THALICTRUM CULTRATUM, *Wall.*

Hooker and Thomson in the *Flora of Brit. Ind.* are already of the opinion that *T. platycarpum*, H. f. et T., is probably only an alpine state of *T. cultratum*. Lecoyer, whose views concerning this form are shared by the writer, formally reduced *T. platycarpum* to *T. cultratum* in his valuable monograph on *Thalictrum*. Related to *T. platycarpum* is a form which was gathered by one of Dr. King's collectors somewhere between the northern frontier of Sikkim and Lhassa. The most important characters which distinguish the two are taken from the ripe fruit; and the differences are rather considerable. Nevertheless a careful investigation into their relationships makes the writer averse to claiming the new form as an independent species, and it appears to him preferable to consider it, like *T. platycarpum*, a subspecies of *T. cultratum*. We have thus—

Subspecies I. CULTRATUM VERUM; a middle-sized or tall herb (40—100 cm. high); pedicels elongate, filiform, 10—30 mm. long; anthers long-linear; stigma very narrowly winged; achenes distinctly stipitate (rarely one or another subsessile), attenuated towards the base, on transverse section nearly anceps, not wrinkled; lateral nerves slightly anastomosing upwards, without stalk 5—7 mm. long.—Kashmir; Garhwal; on the Kedar Kanta and elsewhere; Nipal; Sikkim, 8—12,000′.

Subspecies II. PLATYCARPUM, *H. f. et T.*; middle-sized herb (25—50 cm. high); pedicels elongate, filiform, 10—20 mm. long; anthers elliptic-oblong; stigma broadly or narrowly winged, subsagittate at the base; achenes manifestly stipitate, attenuated towards the base, on transverse section angular subcultrate, not rugose; lateral nerves simple, without stalk 3—4 mm. long, scarcely convex along dorsal, very convex along ventral suture, minutely glandular; (wings of stigma revolute in the ripe fruit).—Western Tibet; Garhwal; Southern Tibet, north of Sikkim.

Subspecies III. TSANGENSE, *P. Brühl*; rather small (15—20 cm. high), very much branched; pedicels short, 3—4 mm. long; anthers linear; stigma broadly winged, very acutely triangular, wings erose and laciniate; achenes subsessile, asymmetrically obovoid, dorsally gibbous near apex, ventrally very convex, on transverse section subangular, glabrous, attenuated towards the base, lateral nerves scarcely anastomosing, 2·5—3 mm. long, wings of stigma reflexed in the fruit.—Tibet, north of Sikkim (*King's Collector*).

PLATE 102. *Thalictrum cultratum*, Wall.: the letters c, h (misprint for p), t refer to subspecies *cultratum verum*, *platycarpum*, and *tsangense* respectively. 1, upper part of inflorescence of *T. cultratum verum*; 2, *T. platycarpum*; 3, *T. tsangense*; 4-6, sepals; 7-9, stamens; 10 and 11, head of achenes; 12, pistil; 13-15, ripe achenes, and 16-18, stigmas, of *T. cultratum*, *T. platycarpum*, *T. tsangense* resp.; *all of natural size.*

CLEMATIS MONTANA, *Ham.*

Shrub or undershrub, climbing or sarmentose; flower-bearing branchlets from the axils of fallen leaves, usually much shortened, scaly at the base; leaves trifoliate; leaflets membranous to subcoriaceous, rarely quite leathery, mostly ovate or ovate-lanceolate, serrate or serrately incised, rarely quite entire; flowers usually crowded; pedicels 3—15 cm.

long; sepals 1—5 cm. long, white, yellow, or reddish, spreading; stamens distinctly shorter than the sepals; filaments glabrous, linear; anthers linear, blunt or subapiculate; achenes laterally compressed, persistent style plumose, 2·5—4 cm. long.

Flowers from April to September.

Geographical distribution—Hindu Kush, Kaffiristan, temperate Himalaya, Moupine, Yunnan, Assam Hills, Chota Nagpur, (Japan).

O. Kuntze enumerates and names under the head of *Cl. montana*, subspecies *normalis*, thirteen varieties, which are mostly characterized by single characters. Now there are specimens which possess at the same time incised (var. *incisa*) and pubescent (var. *pubescens*) leaves, obtuse (var. *obtusisepala*) and yellow (var. *flavida*) sepals, with peduncles shorter than the leaves (var. *brevi-pedunculata*); and it would not have been difficult to define and name a number of other varieties according as the leaves are glabrous, pubescent, or subhirsute, as the pedicels are hairy or glabrescent, as the stamens are longer or shorter than the pistils, as the style is straight or recurved, as the stigma is canaliculate or no. We should thus have performed the remarkable feat of making a single specimen belong to a dozen or more named (!) varieties. That would be Systematic Botany with a vengeance!

The following Indian, Tibetan, and Yunnanese varieties may be distinguished:—

A. Varieties with abbreviated flower-bearing branchlets; leaves of flowering branchlets crowded; flowers one or several, originating in the axils of scales.

Var. α. ANEMONIFLORA, (*Don pro sp., non O. Ktze*); leaflets lanceolate, acuminate, membranous, serrate rarely quite entire, glabrous or nearly so above, hairy or glabrous beneath; flowers appearing with the leaves usually many on the abbreviated branchlets; pedicels longer or shorter than the leaves, glabrous or pubescent; sepals obovate, rounded or obtuse at the tip, 1·5—3 cm. long, beneath subglabrous except at the pubescent edges; stamens usually 80—120. Gilgit (*Tanner!*); Kashmir (*Clarke!*); Hazâra (*Stewart!*); Black Mountain (*Duthie!*); Simla (*Gamble!*); Garhwal near Massuri (*Duthie!*); Kumaon, near Naini Tâl, and on the Kedar Kanta (*Royle!*).

Var. β. INCISA, *O. Ktze*; leaflets membranous, lanceolate, acuminate, 1—6 cm. long, incised, cuneate, above more or less coarsely hairy; flowers with the leaves, solitary or crowded on the shortened branchlets; pedicels usually longer than the leaves, hairy or nearly glabrous; sepals oblong, obtuse, mucronulate, 15—25 mm. long, glabrescent on back; stamens 60—90. Garhwal, on the Kedar Kanta 10—11,000′ (*Duthie!*); Nipal (*Scully!*).

Var. γ. CHUMBICA, *P. B.*; leaflets obovate or rhomboid, more or less deeply trifid, mucronate-serrate, cuneate, above adpressedly hairy, beneath more or less villous; flowers with the leaves, crowded on the abbreviated branchlets; pedicels as long as, or longer than, the leaves, villous; sepals oblong or obovate, rounded at the tip and mucronulate, rarely subacute, 15—25 mm. long, pubescent or villous beneath; stamens mostly 25—40. Chumbi (*King's coll.!*); Sikkim, near Ling-tu (*King's coll.!*), Lamtong (*King's coll.!*), Phullut (*King's coll.!*).

Var. δ. PRAECOX, *O. Ktze.*; leaflets pubescent or villose; flowers before the leaves; sepals obovate, rounded, 12—20 mm. long, pubescent beneath. Closely related to γ. Sikkim: on Phullut (*King's coll.!*).

Var. ε. FASCICULIFLORA, *Franchet pro sp.*; leaflets leathery, lanceolate, quite entire, glabrous above, glabrescent beneath; flowers with the leaves; pedicels 2—3 cm., silky; flowers rather small; sepals obovate-oblong, obtuse, densely sericeous beneath; stamens biseriate.—Yunnan.

Var. ζ. GRANDIFLORA, *Hook.*; leaflets membranous or subcoriaceous, ovate or ovate-lanceolate, acuminate, at the base rounded or subcuneate, serrate, rarely quite entire, above glabrous or hairy along the nerves, glabrous to villous beneath; flowers with the leaves, 2 or more on the abbreviated branchlets; pedicels glabrous or nearly so; sepals obovate, at the apex rounded or very shortly and abruptly acuminate or subacute and mucronulate, 3—5 cm. long, beneath glabrescent in the middle; stamens 80-120.

Kashmir (*Herb. Calc.!*); Jaunsar (*Gollan!*); Krōl (*Drummond!*); Sirmor (*Drummond!*); Garhwal (*Herb. Falc.!*); (*Schlich!*).

Var. η. MANIPURENSIS, *P. B.*; leaflets firmly membranous, the terminal ones often 5—9 cm. long, 2—5 cm. broad, ovate, obtuse or subacute at base, narrowly acuminate, incisedly 2—3-fid., coarsely mucronulate-serrate, adpressedly hairy; flowers with the leaves; solitary or in pairs on the shortened branchlets, pedicels rather shorter than the leaves, hairy; sepals ovate or oblong, narrowly acuminate, 25—40 mm. long; stamens 50—80. Manipur, 7,000′—9,500′ (*Watt.!*); Naga Hills (*Colomb!*).

Var. θ. INTERMEDIA, *B. P.*; leaflets firmly membranous, ovate or elliptic, entire or subtrifid, coarsely serrate, puberulous above, glabrous or nearly so beneath; flowers 1—3 on the abbreviated branchlets; pedicels about as long as the leaves, puberulous; sepals lanceolate, shortly and very acutely acuminate, 25—40 mm. long, 10—15 mm. broad, beneath tomentose at the edges, otherwise glabrescent; stamens 60—80. Merging into *e*. Sikkim: on Tonglu (*K.'s Coll.!*).

B. Varieties with the flower-bearing branchlets elongated, scaly at the base; leaflets of flowering branchlets distant; flowers solitary in the axils of the leaves, peduncles eperulate at the base; sometimes with additional abbreviated branchlets.

Var. ι. TONGLUENSIS *P. B.*; leaflets firmly membranous, ovate, acuminate, irregularly serrate, sometimes subtrifid, rounded or subcuneate at base, glabrous or puberulous; sepals lanceolate, acutely acuminate, 3—5 cm. long, breadth $\frac{1}{4}$—$\frac{2}{5}$ of length, in the bud pubescent on the inner surface, outer surface tomentose along margin, glabrescent in the centre; stamens 50—80. Sikkim: on Tonglu (*T. T.! Gamble! K.'s coll.!*); Rungbūl 7,800′ (*K.'s coll.!*); Gantūk (*K's coll.!*).

Var. κ. KHASIANA *P. B.*; leaflets firmly membranous, broad-ovate, rounded or subcuneate at base, coarsely pauci-serrate, shortly acuminate, hirtulous at nerves; sepals elliptic or obovate, at the tip very shortly and narrowly acuminate, in the bud glabrous inside, outside tomentose at the edges, otherwise glabrescent; stamens 50—80. Khasia (*Herb. Calc.!*).

PLATE 103. *Clematis montana*, Ham.; 1, flowering branchlet of var. *tongluensis*; 2, flower of var. *khasiana*; 3, flower and branchlet of var. *manipurensis*; 4, flower of var. *anemoniflora*; 5, terminal leaflet of var. *edentata* of O. Ktze; 6, leaf of var. *incisa*; 7, pedicel of var. *chumbica*; 8, outermost stamen; 9, innermost stamen; 10, pistil; 11, stigma of var. *tongluensis*.

CLEMATIS ACUMINATA, *DC.*

A large woody climber, more or less thickened at the nodes; leaves trifoliate leaflets coriaceous to membranous, ovate to ovate-lanceolate, entire or serrate; inflorescence dichasial or cymose-paniculate, three or many-flowered; adult buds cylindric or oblong-ellipsoid; sepals erect, nearly straight or with recurved tip, in open flower entirely tomentose outside or only along the edges; filaments linear, densely hairy; anther, linear, not beaked; achenes compressed, moderately or scarcely thickened at the edges; persistent style feathery.

O. Kuntze unites *C. Leschenaultiana* D. C. with *C. acuminata*; the leaves of the former are certainly sometimes exactly like those of *C. acuminata*, var. *sikkimensis*; they vary also largely in the density of

their indumentum; and since the sepals of *C. acuminata* var. *Wallichii* are, when young, densely pubescent on the outside, there is indeed no good character to separate the Javanese plant from *C. acuminata*. Closely allied to *C. acuminata* var. *Wallichii* is Franchet's *C. yunnanensis*, which differs from the former chiefly in the leaflets being smaller and their texture being somewhat firmer, and in the inflorescences usually originating in the axils of branches. We arrive thus at the following arrangement.

Subspecies I. Leschenaultiana, *DC.*; leaflets coriaceous to chartaceous, ovate or broadly ovate lanceolate, terminal ones 5-14 cm. long, more or less covered with coarse hairs; sepals covered outside with coarse brownish tomentum; inflorescences from axils of leaves.– Sumatra, Java, Timor. The statement that it has been found in the Nilgiris rests probably on some error.

Subspecies II. Wallichii, *H. f. et T.*; leaflets chartaceous, ovate-lanceolate, 6—12 cm. long; sepals outside tomentose-marginate otherwise pubescent; inflorescences from axils of leaves.—Flowers from October to December.—Garhwal (*Royle*, *Brandis!*); Kumaon (*Davidson!*); Nepal (*Wallich!*); Bhūtān (*Herb. Calc.!*).

Subspecies III. yunnanensis, *Franchet*; leaflets chartaceous, ovate lanceolate, 3—6 cm. long, puberulous; sepals puberulous outside; inflorescences mostly from the axils of branches.—Yunnan.

Subspecies IV. sikkimensis *Hook. fil. et Thomson*; leaflets chartaceous or subcoriaceous, ovate or oblong, terminal ones 6-15 cm. long; sepals outside tomentose-marginate, otherwise glabrous or pubescent inflorescences from axils of leaves.—Flowers from September to December.—Central and eastern temperate Himalaya; Mishmi and Naga hills; Burma; Yunnan (?).

Var. a. Hookeri, *P. B.*; leaflets ovate-oblong or ovate-lanceolate; inflorescences many-flowered: sepals 10—15 mm. long, ovate-oblong, with obtuse tip.—Simla (*Gamble!*); Sikkim (*Hook. fil.*; *King!*); near Darjeeling (*T. Thomson*, *Gamble!*), Senchal (*Kurz!*); Kurseong (*Clarke!*); Bhūtān, 6,000′, (*Clarke!*); Assam: Jowai 5,000′ (*King's coll.!*); Mishmi (*Griff.!*); Naga Hills (*Griff.!*); Pegu (*Brandis!*).

Var. β. Clarkei, *O. Kuntze* (*emend.*); leaflets broad-ovate; inflorescences 3-flowered, sometimes with some undeveloped additional buds; sepals 15—20 mm. long, ovate-oblong, acute.—Sikkim (*Clarke*; *King.!*).

Var. γ. Andersoni, *P. B.*; leaflets ovate-oblong, short-acuminate; inflorescences several-flowered; sepals 25—30 mm. long, lanceolate-linear, obtuse or subacute and minutely apiculate at the tip. Northern Burma or Yunnan (*Anderson*).

Plate 104. *Clematis acuminata, DC.* 1, flowering branch of *C. Wallichii*; 2, stamen; 3, pistil of the same; 4 and 5, inflorescence and terminal leaflet of *C. sikkimensis*, var. *Hookeri*; 6, inflorescence of var. *Clarkei*; 7, flower of var. *Andersoni*.

Anemone Griffithii *H. f. et T.*

Rootstock woody, more or less horizontal. *Stem* slender, 7—15 cm. high when in flower, glabrous or somewhat hairy below. *Basal leaves* usually solitary, with the undeveloped bud of next year in their axils, very long-petioled, trisect or trifoliolate with the leaflets short-petioled, sparsely adpressedly hairy along the nerves on both surfaces or glabrous on the lower surface; *lateral leaflets* or segments more or less asymmetric, bi- or trifid, sometimes only obscurely so, middle one more or less trifid, all of them cuneate at the base or the lateral ones semicordate, acute at the tip, crenate-serrate or incised-crenate, 12—24 mm. long, crenatures apiculate. *Petiole* sheathing and hairy at the base, upwards glabrous or nearly so, 2—3·5 times as long as the blade. Cauline leaves 3, whorled, similar to the basal leaves, but often rather smaller, petiole only $\frac{1}{2}$ to $\frac{3}{4}$ the length of the blade. *Peduncle* slender, ebracteate, $\frac{1}{4}$ to $\frac{2}{3}$ as long as the stem below the

whorl of leaves. *Sepals* 4—5, membranous, ovate or elliptical, with branching nerves, inserted with a rather broad base, obtuse, 6—10 mm. long, $\frac{3}{5}$—$\frac{2}{3}$ as broad, glabrous. *Receptacle* hemispherical, 1—1·5 mm. dia., glabrous. *Stamens* about 30, $\frac{1}{3}$—$\frac{2}{3}$ the length of the sepals, glabrous; filaments complanate-filiform, outer ones 2—2·5 mm., inner ones 3—4 mm.; anthers elliptic, blunt, about 1·2 mm. long, connective very narrow. *Pistils* 25—30, glabrous, inner ones 2, outer about 1 mm.; ovary ovate, lenticularly compressed, style tapering, of innermost pistils nearly as long as the ovary, of outer ones much shorter. *Achenes*?—Sikkim: Lachen Valley, 8—9,000′; Chumbi: near Pey-gung-la; Bhutan, near Chuka 6,000′; Mishmi. Flowers in June.

PLATE 105*A*. *Anemone Griffithii*, H. f. and Th.; 1, flowering plant; 2, sepal; 3, stamen; 4, pistil; 5, stigmatic surface.

ANEMONE FALCONERI, *T. Thomson.*

Regel in his *Enumeratio Plantarum cis- et transsiliensium* describes the fruit of *Anemone Falconeri* thus:—*acheniis lineari-oblongis, subteretibus, costatis, puberulis, stigmate brevissimo.*

Prof. Janczewski has drawn attention to a peculiarity which is common to all the species that go to form his subgenus *Hepatica* (*H. triloba, H. transsilvanica, H. Falconeri*); the basal portion of the achene forms a kind of pedicel called hypophyse by Janczewki, which in the ripe fruit is translucent and coloured brown, but which in consequence of shrinkage attendant upon desiccation is apt to be overlooked. The function of this hypophyse is as yet unknown. It appears to be less distinctly developed in *A. Falconeri* than in the other two species. Ripe achenes of *A. Falconeri* have, however, not yet been collected in India, and we invite the attention of Indian botanists to this interesting subject.

PLATE 105*B*. *Anemone Falconeri*, T. Thoms.; 6, flowering plant; 7, sepal; 8, stamen; 9, pistil of *A. Falconeri.*

ANEMONE OBTUSILOBA, *Don.*

The forms which group themselves round the typical *Anemone obtusiloba* are usually associated with *A. rivularis, A. pennsylvanica, A. antucensis* and others, whilst Janczewski in his very interesting *Études morphologiques sur le genre Anemone* unites them with *A. capensis, A. alchemillæfolia*, and *A. glaucifolia*, to form his subgenus *Pulsatilloides*. There exists, however, the closest possible relationship between *A. obtusiloba* and *A. polyanthes*, a relationship which appears to have suggested itself already to Prantl,* and which is indicated by *A. obtusiloba* having a monopodial (zweiachsiges) rhizome like *A. narcissiflora*, Linn., *A. tetrasepala*, Royle, *A. elongata*, Don, *A. gelida*, Maxim., *A. demissa* H. f. et T., and the true *A. rupestris* of Wallich; further by the frequently evinced tendency of *A. obtusiloba* towards the formation of an umbellate inflorescence; by the achenes of some varieties of this species from Kumaon and Nipal being very decidedly compressed, so much so that the writer was for some time doubtful whether they should not be referred to *A. demissa* H. f. et T., to which they certainly do not belong; and finally by the ovaries of *A. polyanthes* sometimes, though seldom, bearing a few stiff hairs, so that it becomes practically impossible to distinguish the pistils of these forms of *A. polyanthes* from those of the flat-carpelled Nipal variety of *A. obtusiloba*. The association of *A. obtusiloba* with *A. glaucifolia* and *A. capensis* appears to me inadmissible. Geographical distribution, of course, counts here for nothing; for not only is the Yunnanese *A. glaucifolia*, Franchet, closely allied to the South African *A. capensis* and *A. alchemillæfolia*, but what is still more remarkable, there are, as is pointed out by Franchet in his *Plantae Delavayanae*, certain points in common between Franchet's species and Baillon's section *Viornanema*, a small, but highly interesting group of African species of *Clematis*. Thus limited there appears to exist a sufficiently close relationship between this

* Engler's Botanische Jahrbücher, IX, 1887, page 248.

section of *Anemone* and the species belonging to the old genus *Pulsatilla* to justify DeCandolle's group-name of *Pulsatilloides*, contrary to Janczewski's dictum: "Il est difficile de compendre pourquoi De Candolle a donné ce nom à une section embrassant deux plantes africaines què ne présentent aucune affinité avec nos Pulsatilles." The hairs on the ovaries, when present, are mostly rigid, as they are in the species which go to form the section *Pulsatilloides*; but in a variety of what I call subspecies *ovalifolium* from Kumaon the hairs are rather soft, whilst in undoubted forms of *A. obtusiloba* from Kansu the ovaries are in some plants densely hairy, in others perfectly glabrous without the plants differing from each other in any other detail. This abolishes, moreover, one of the distinguishing characters of the *A. rupestris* of the Flora of British India. As regards the latter it has to be mentioned that the carpels of the form referred to are usually more or less beset with stiff hairs, quite according to the manner of certain forms of *A. obtusiloba* from Chamba and Nepal. We have, therefore, to consider the value of the *leaves* in furnishing diagnostic characters to serve in the discrimination of the forms allied to *A. obtusiloba*. We begin with *A. trullifolia* H. f. et T. There is now in the Calcutta Herbarium a large collection of specimens belonging to this form, gathered in Sikkim, Chumbi, and Setchwan. They all agree with each other as regards habit, structure of flower, indumentum, and the colour of the sepals; the leaves of most of them are like those shown in (A) of plate 106; the extreme forms (*figs.* 13 *and* 19) are placed side by side, but they are connected by forms with leaves like those represented in figures 14—18. The leaf shown in *fig.* 13 does not differ in form so very much from leaves of *A. obtusiloba* of the shape shown in fig. 4. Franchet endeavours to resuscitate Royle's *A. discolor*. He says in his *Plantæ Delavayanae*: "Je crois qu'il faut conserver le nom d' *A. discolor*, Royle, à une plante très-voisine de l' A. *obtusiloba*, mais qui s'en distingue facilement par la forme nettement pentagonale, à l'angles assez aigus, de ses feuilles. L' *A. discolor* est aussi moins velu." The transition as to form of leaves between those plants which, according to Franchet, would severally constitute the two species *A. obtusiloba*, Don, and *A. discolor*, Royle, is sufficiently illustrated by figures 1—6 of plate 106 to definitely dispose of *A. discolor* as a species or even variety. There are a number of aberrant forms which, to a certain extent, may be distinguished from the typical *A. obtusiloba* by the leaves being more or less distinctly ovate in outline, not pentagonal nor semicircular or subreniform; they gradually shade into the type; but forms like that depicted in (B) of plate 106 look very distinct I unite them into a subspecies which I call *A. ovalifolia*. Although differing in their outline, such deeply divided leaves as those of some forms of *A. ovalifolia* appear to render the reduction of the *A. rupestris* of the *Flora of Brit. Ind.* imperative; nor does *A. imbricata*, Maxim., lie outside the group of forms which have diverged from the typical *A. obtusiloba*. The *A. rupestris* of the Calcutta Herbarium—there is an original Wallichian type-sheet here—is different from the *A. rupestris* distributed under this name from Kew, and evidently the one described as such in the *Flora of Brit. Ind.* Wallich, as has happened pretty frequently with him, appears to have distributed quite different species under the same name. As, however, the form described by Hooker and Thomson in the *Flora of Brit. Ind.* has to be reduced to *A. obtusiloba*, I have changed its name into *A. saxicola*, leaving the name *A. rupestris* to the species to which doubtlessly Wallich originally meant to give it. The following is a classification of the numerous forms which we thus see ourselves constrained to include in *A. obtusiloba*:—

Subspecies I. TRULLIFOLIA, *H. f. et T.*; mostly villous; scapes erect or more frequently ascending or prostrate, 5—20 cm. long; leaves subsessile or shortly or rather long-petioled (petiole some times as long as the blade), obovoid-subspatulate, more rarely rhomboid or suborbicular in outline, sometimes oblong-linear, cuneate or rarely obtuse or even cordate at the base, coarsely crenate-serrate, more or less distinctly 3—lobed; sepals elliptic, golden yellow, usually 2 to 3 times as long as the head of stamens; carpels densely hirsute.

Var. α. LINEARIS; leaves oblong linear or oblanceolate, entire or scarcely serrate at the apex. Tachienlu region (*Pratt* n. 493!).

Var. β. SPATULATA; leaves obovate-subspatulate or rhombic, entire or very shortly trilobed, cuneate at the base, coarsely crenate-serrate. Sikkim (*H. f. and others!*), near

Thaling, Tsumtong (King's collectors!); Chumbi: on Pit-zē-lā, Pan-ka-lā, Oey-gūng-lā; Phari (*King's collectors!*); Bhutan; N. W. Himalaya?

Var. γ. ROTUNDIFOLIA; leaves suborbicular, manifestly petioled, very broadly cuneate, rounded, or shallow-cordate at the base, trilobed to $\frac{1}{3}$ to $\frac{1}{2}$. Sikkim: near Thaling 13,000′, and in other localities (*Cunningham, G. Gammie, King's collectors!*).

Subspecies II. CŒLESTINA, *Franchet*; scapes erect or ascendent; leaves more or less long-petioled, long-cuneate, subtrilobed, lobes obtuse, middle one incised-crenate, lateral ones entire or scarcely crenate, upper surface somewhat hairy, lower surface silky-villose; sepals 5, 6—8 mm. long, ovate, obtuse, blue, sometimes white inside, silky outside; carpels hirsute.—Yunnan.

Subspecies III. OVALIFOLIA *P. Brühl*; more or less villous; scapes sometimes elongate and upright, usually short, ascending or more frequently prostrate or procumbent; leaves long-petioled, ovate in outline, more or less cordate, trisect or trifoliolate, 12—25 mm. long; middle segment cuneate-obovate, 3-lobed or 3-partite; lateral ones usually $\frac{1}{2}-\frac{2}{3}$ the length of the middle one, broadly obovate or suborbicular, trilobulate; petiole usually 2 to 3 times the length of the blade; sepals 5, suborbicular or broad-elliptic, 5—8 mm. long, usually little longer than the androgynoecium; ovaries hirsute, hairs rigid or rather soft, sometimes quite glabrous; achenes sometimes much compressed.

Var. a. GEOCHARES; scapes usually prostrate or procumbent, more rarely ascending, 4—10 cm. long; sepals greenish-yellow (or quite yellow?), more commonly dark-red or reddish-brown outside, white inside; ovaries hirsute or glabrous. North Tibet (*Przewalski!*); Kansu (*Potanin*); Tachienlu region (*Pratt* 176); Phari (*King's collector*).

Var. β. ORTHOCAULA; scapes erect or ascending, 15—20 cm. long; sepals yellow, bluish near base; achenes much compressed, beset with softish hairs. Kumaon, near the Lebung pass, 14—15,000′ (*Duthie*).

Subspecies IV. SAXICOLA, *P. Brühl* (= *A. rupestris* of the *Flora of British India*); scapes erect, slender, somewhat hairy; leaves glabrous or somewhat villose, very long-petioled; blade suborbicular or reniform in outline, cordate, trisect; segments subsessile or petiolulate; lateral segments little shorter than the middle one, 2—3 lobed; middle segment more petiolulate, subreniform, tripartite, divisions 3- (or 2-) lobed; segments and lobes overlapping, the latter entire lobulate or paucicrenate; petiole slender, 2—6 times the length of the blade; sepals elliptic or broad-obovate, 2—3 times as long as the androgynoecium; carpels glabrous or more frequently with sparse rigid hairs.—Kashmir (*Falc. No.* 28!), Pir Panjāl; Nipal, in Gossain Than; Sikkim, 15,000′ (*according to Fl. of Br. Ind.*).

Subspecies V. OMALOCARPELLA, *P. B.*; villose; scapes ascending; leaves trisect, segments obovate, narrow-cuneate, the middle one longer and broader, deeply trilobed, lateral ones incised-lobate, lobules sparsely serrate-crenate; sepals 6—9, 9—17 mm. long, 2—3 times the length of the androgynoecium, oblong, white with a lead-coloured spot; carpels nearly flat, margined, quite glabrous or with a few rigid hairs; style short, hooked.—Nipal (*Scully!*).

Subspecies VI. OBTUSILOBA (TYPICA); usually very villose; scapes erect, ascending, or prostrate, 7—50 cm. long; leaves long-petioled; blade reniform, suborbicular, pentagonal, or broad-ovate in outline (when broadly ovate, 4—6 cm. long), more or less cordate, sometimes trilobed to the middle, usually tripartite or trisect; lateral segments ($\frac{2}{3}$—) $\frac{3}{4}-\frac{4}{5}$ the length of the middle one; segments cleft or lobed; sepals elliptic, obovate-oblong, or broadly obovate, 2·5 to 4 times the length of the androgynoecium; carpels subcompressed, hirsute with rigid hairs, rarely sparsely hairy.—Gilgit; temperate and Alpine Himalaya; Yunnan.

However greatly the various forms of this subspecies differ from each other in the indumentum—densely villose to nearly glabrous,—the length of the scape, the form and depth of division of basal leaves, the size, form, and division of the involucral leaves, the colour of the sepals—yellow, yellow or white inside and blue or bluish outside, with or without a lead-coloured spot—hairiness of carpels: the variability is so great and the transitions so gradual that it appears to be a thankless task to split up

this subspecies into varieties, if the definition of such varieties is to be more than a description of individual specimens.

PLATE 105C. *Anemone obtusiloba*, Don. subspecies *saxicola*; 11, sepal; 12, stamens; 13, pistils.

PLATE 106A. *Anemone obtusiloba*, sub-spec. *trullifolia*; (B) *Anemone ovalifolia*, var. *geochares*. 1—22, leaves: 1—6 of subsp. *typica*: 1 *from Ling-tu*, 2 *N.-W. Him.*, 3 *Dalhousie*, 4 *N.-W. Him.*, 5 *Sandakphu*; 7, of subsp. *omalocarpella*, *Nipal*; 8 and 9, of subsp. *ovalifolia* var. *geochares* from *Kansu*, 10 and 11, the same from *Phari*; 12, of *ovalifolia* var. *orthocaula*, *Lebung Pass*, *Kumaun*; 13—18, of subsp. *trullifolia*, *Sikkim*, *Chumbi*, *Phari*; 19, of subsp. *trullifolia*, var. *linearis*, *Tachienlu region*; 20, of subsp. *saxicola*, *N.-W. Him.*; 21—22 of subsp. *imbricata*; 23 stamens of subsp. *ovalifolia*. 24-31, 33 Pistils: 24—25 subsp. *obtusiloba* vera, *Chenab valley*; 26 subsp. *trullifolia*, *Sikkim*; 27 subsp. *ovalifolia*, *Phari*; 28, 29 subsp. *ovalifolia*, *Kansu*; 30 the same, *Lebung Pass*; 31 subsp. *omalocarpella*, *Nipal*; 33 subsp. *imbricata*; 32, advanced carpel of subsp. *omalocarpella*, *Nipal*.

NOTE.—(In plate 105C. the name *A rupestris*, Wall, should be changed to *A. obtusiloba* subsp. IV.)

ANEMONE RUPESTRIS, *Wall. Cat.* 4696 *in Herb. Calc.*

Primary root soon disappearing. Rhizome short, tuberiform, sometimes forked, ovoid or ellipsoid or, when older, short cylindric, 7—18 mm. long, 3—8 mm. thick, emitting filiform root-fibres, covered upwards with the remains of the sheaths of fallen leaves, the apical growing point surrounded by the rudiments of leaves consisting of a three-nerved subevolute sheath and a crenulate or obscurely 5-fid lamina, and often bearing in their axils the rudimentary bud of the flowering stem of the following year. Basal leaves 4—8, crowded, very long-petioled; petioles dilated at their base into a membranous, glabrous or subvillous, very short (2—3 mm.) sheath, slender (1—) 2—8 cm. long, 0·7—1 mm. broad, subglabrous or subvillose; blade membranous, ovate or ovate-oblong in outline, tripartite, trisect, trifoliolate or subpinnate, at the base subcordate or subtruncate, 2—20 mm. long, subisodiametric, subglabrous or somewhat hairy, sometimes silky; terminal segment often petioluled, semicircular or rhombic in outline, 5—14 mm. diameter, three-lobed or oftener tripartite or trisect, with the lateral divisions sometimes subcrenate and petiolulate; lateral segments broadly deltoid or subreniform, rarely subentire, usually three-lobed 4—10 mm. long, ultimate lobes quite entire or serrate-crenate, crenatures obtusely apiculate. Flower-bearing branches scapiform, solitary or 2—6 from the axils of fallen leaves, erect or ascending, slender, 3—18 cm. long, 0·8—1·5 mm. thick, ($\frac{1}{1}$—) $\frac{4}{3}$—$\frac{2}{1}$ the length of the basal leaves, subvillous, towards the base usually less hairy or even subglabrous. Floral leaves 3, whorled, inserted at the middle or above the middle, rarely close to the flower, sessile, free or scarcely connate at the base, 5-nerved, the nerves being fine, simple or branched, ovate, oblong, or obovate, wedge-shaped, quite entire or sparsely and obtusely serrate, 4—10 mm. long, breadth $\frac{1}{4}$—$\frac{2}{3}$ the length, back glabrous or slightly hairy, margin ciliate. Flower solitary, erect. Torus subhemispheric, 1—1·5 mm. in dia., glabrous. Sepals usually 6, spreading, with branched nerves, oblong elliptic or obovate, somewhat concave, broadly cuneate; at the tip obtuse or rounded, sometimes retuse, 5—8 mm. long, breadth $\frac{2}{5}$—$\frac{3}{5}$ of length, upper surface white or light-red and glabrous, lower surface red and glabrous or slightly hairy below, subpersistent. Staminodes none. Stamens 6—18, about half as long as the sepals, spreading, subequal or the outermost distinctly shorter, glabrous subpersistent; filaments dilated, near the apex more as less thickened, the outer ones broadly linear or lanceolate and shorter or all of them broad-ovate or elliptic, 2—3 mm. long, the breadth of the broader ones $\frac{3}{5}$—$\frac{2}{3}$ their own length; anthers broad-elliptic, blunt, 0·6—0·9 mm. long, sublaterally

dehiscing (bluish). Pistils 6—15, forming a lax head, glabrous; ovaries before fertilization plano-compressed, 2—2·5 mm. long, after fertilization lenticular, elliptic, moderately asymmetric, more convex along dorsal suture, at the base very shortly attenuated, intramarginal nerves little distant from the edges, confluent at the base; style subulate, 0·7—1 mm. long, stigmatiferous along the whole ventral suture. Ovule obovoid. Immature achenes lenticularly compressed, 3—4 mm. long, glabrous.

Flowers in June and July.

Distribution: Central and Eastern Alpine Himalaya.

This species has been already referred to under the head of *A. obtusiloba*; it has some affinities with the subspecies *ovalifolia*, but is at the first glance seen to be a distinct species. It appears to be closely related to *Anemone gelida*, Maximowicz. The following table exhibits their points of agreement:—

Anemone rupestris, Wall.	*Anemone gelida*, Maxim.
Rhizoma breve, tuberiforme, radice primaria mox evanida.	Rhizoma brevissimum, crassum, praemorsum.
Petioli 2—8 cm. longi.	Petioli ad 5 cm. longi.
Caules 1—4 flaccidi, folia basalia interdum duplo superantes praesertim superne pilosi.	Caules 1—3 flaccidi, folia radicalia duplo vel triplo superantes praesertim superne pilosi.
Folia floralia 3 sessilia, basi late cuneata.	Involucrum triphyllum foliis sessilibus cuneatis.
Pedunculus solitarius, elongatus vel brevis.	Pedunculus solitarius, elongatus.
Flos plerumque parvus, erectus.	Flos parvus erectus.
Sepala saepissime 6, 5-nervia, 5—8 mm. long, latitudine $\frac{2}{5}$—$\frac{3}{5}$ longitudinis, saepe obovata, utrinque glabra.	Sepala 6—8, 5-nervia, 9·5 x 4·5 mm. obovata, utrinque glabra, stamina duplo superantia.
Stamina sepalis dimidio breviora.	
Antherae 0·6—0·9 mm.	Antherae 0 6 mm.
Carpella subovata v. elliptica, lenticulari-compressa.	Carpella ovata, lenticulari-compressa.
Stigma stylo ovario duplo vel plus duplo breviori oblique adnatum.	Stigma oblique apice styli crassi impositum (Maximowicz.)

The following table shows their differences:—

Folia basilaria ambitu ovata, seriora trisecta, nunquam plane bis trisecta, segmentum terminale haud raro trisectum, sed lateralia triloba tripartitave neque trisecta.	Folia radicalia late deltoidea, seriora complura bis-trisecta, segmentis omnibus petiolulatis, petioluli primarii terminalis ad 10 mm. laterales 4 mm., secundarii 5 et 2 mm. resp.
Torus glaber.	Torus vix pilosulus.
Carpella 7—15.	Carpella numerosa.
Sepala intra alba vel pallide rubra, extra rubescentia, exsiccata saepe straminea.	Sepala sicca sordide ochracea.

It is therefore quite possible that *Anemone gelida*, Maxim., may finally have to be reduced to the rank of a subspecies of *A. rupestris*, Wall.

Var. a. LOBATA, *P. B.*; flowering scapes usually elongated, 8—20 cm. long (but also 3 cm.), flaccid; leaves trisect, terminal segment trilobed, 8—14 mm. broad, usually adpressed hairy, crenatures rather frequent; sepals light-red on both sides or whitish above.—Sikkim: on the Pa-tang-la; Chumbi, at Ley-rong (*King's collectors!*).

Var. β. WALLICHII, *P. B.*; flowering scapes 10—15 cm. long, flaccid; leaf-blade densely adpressed hairy; lateral leaflets distinctly petioled, terminal trisect, broad-reniform in outline, about 8 mm. across.—Nepal: Gossain Thān (*Wall!*).

Var. γ. PUSILLA, *P. B.*; scapes usually very short, 2—6 (—10) cm. long, usually erect; leaflets hairy or sub-glabrous, lateral ones trilobed, terminal trisect or subtrifoliate, 5—8 mm. across, terminal segment of the second order sessile or petiolate. Sikkim: Sey-cho-lā, W. of Jongri; Kapur below Kinchinjanga; Pandim-chu 15,000′ (*King's collectors!*).

PLATE 107*A*. *Anemone rupestris, Wall.* 1, var. *lobata*; 2, var. *pusilla*; 5, basal leaves of various specimens of *A. rupestris*, chiefly of var. *pusilla*; 6, sepal of var. *pusilla*; 7, of var. *lobata*; 11, stamen of var. *lobata*; 12, of var. *pusilla*; 16, fertilised, carpel.

ANEMONE DEMISSA, *H. f. et T.*

Rhizome monopodial. Flower-bearing shoots decumbent or ascending or more rarely erect, villose. Basal leaves broadly ovate in outline, trisect or biternately divided with the primary segments more or less distinctly petiolulate; divisions cleft and crenate or serrate, often over-lapping; blade and petiole silky with long hairs or densely villous, rarely with scanty indumentum. Flowers umbellate, more rarely solitary. Involucral leaves 3, whorled, sessile, tripartite and incised. Sepals 5, 5—18 mm. long, white, or pale blue, or white inside and blue outside. Filaments broad-linear to broadly oblanceolate. Ovaries obovate, narrow-elliptic or subovate, compressed, glabrous. Achene flat, broad-elliptic, subasymmetric, 5—6 mm. long, style subadpressed.

Flowers in July and August.

Distribution:—Eastern Himalaya, East Tibet, Yunnan.

Var. α. UMBELLATA *P. B.*; scapes erect or more commonly ascending, 12—40 cm. high; divisions of leaf-segments more or less over-lapping, crenate-serrate; blade silky with soft subadpressed hairs; petioles villose or sericeous; flowers umbellate, pedicels slender, 2—3 cm. long, elongating, longer than involucral leaves; sepals obovate-oblong, 8—12 mm. long; ovaries obovate or oblong; style straight, about half as long as ovary or longer. Sikkim: Thaling 13,000′, Singalila range (*K.'s coll.!*). Bhutan-Tibetan Frontier at La-ri-tin; Chumbi at Sy-um-Chūn-Chen; Phāri (*K.'s collectors!*), Tachienlu (*Pratt*, n. 601!).

Var. β. MACRANTHA *P. B.*; scapes decumbent or ascending, about 10 cm. long; leaves as in *a*; flowers usually in pairs; pedicels about as long as involucral leaves; sepals broad, elliptic 1·5—2 cm. long; ovaries ovate, style much shorter, tapering; stigma oblique-acute, narrow.—Tachienlu region (*Pratt* n. 745!).

Var. γ. VILLOSISSIMA *P. B.*; scapes decumbent or ascending, flaccid, 3-20 cm. long; leaves rad-ovate to subreniform in outline, 1—5 to 3 cm. across, like the petioles and scapes very villose; leaflets divided into overlapping lobes and crenatures; flowers sometimes solitary, usually in few-flowered umbels; flower-bearing pedicels often not longer than involucral leaves, finally elongating; sepals 4—6 mm. long, obovate, mostly white on both sides, sometimes yellowish-blue outside; ovaries obovoid or subcylindric, style usually short and thick, stigma capitate, subterminal.—Sikkim: near Jougri 13,000′, on the Zey-lap-lā; Chumbi: near Le-rong. (*King's collectors!*).

Var. δ. CONNECTENS *P. B.*; scapes suberect, flaccid, like the petioles and petiolules villose, 10—15 cm. long; division of leaves slightly over-lapping, crenate-serrate, blade rather scantily hairy; flowers solitary; pedicels slender, about 2—3 times the involucral leaves; sepals obovate, 4—6 mm. long; ovaries elliptic-oblong; style short.—Sikkim: near Rang-chen 15,000′ (*King's collector!*).

Var. ε. MONANTHA *P. B.*; scapes suberect or ascending, slender, 5—12 cm. long, subvillose; divisions of slightly hairy blade spreading, not over-lapping; blade 2—2·5 cm. across; flowers solitary; pedicel distinctly longer than the involucral leaves; sepals obovate-oblong, cuneate, about 1 cm. long, white; androgynaecium forming a conspicuous globular head, stamens 30—40, pistils 40—50; filaments linear and linear-lanceolate; ovaries elliptic-oblong, moderately compressed; style about half as long as ovary, recurved.—Sikkim: on the Tankra-Lā 15,000′ (*G. Gammie!*). This variety is possibly identical with Franchet's var. *yunnanensis*.

PLATE 107*B*. *Anemone demissa*, H. f. & Th. 1, var. *umbellata*; 4, var. *monantha*; 8, sepal of var. *umbellata*; 9, of var. *villosissima*; 10, of var. *monantha*; 13, stamens of var. *umbellata*; 14, of var. *villosissima*; 15, of var. *macrantha*; 17, pisti of var. *umbellata*; 18, of var. *villosissima*; 19, of var. *macrantha*; 20, of var. *monantha*; 21, achene of var. *umbellata*.

ANEMONE ELONGATA, *Don.*

Rhizome woody, stout, fusiform. Basal leaves very long-petioled with the nerves little prominent, reniform or semicircular in outline, usually rather shallow-cordate, deeply tripartite or trisect, 4—12 cm. from base to tip, paler beneath, subglabrous or more or less pubescent, especially along the nerves; lateral segments trapezoidal or unsymmetrically obovate in outline, often semicordate, unequally bipartite, outer division bifid, inner irregularly trifid, secondary segments cuneate, and coarsely and irregularly serrate; petiole shortly sheathing at the base, slender, 2—6 times the length of the blade, subglabrous or moderately hairy. Stems erect, longer than the leaves, 30—100 cm. long, glabrous or somewhat pubescent, usually villose at the insertion of involucral leaves. Inflorescence a large, lax, subumbellate cyme. Involucres of the first order usually 2-, more rarely, 3-leaved; leaves cuneate at base, broad-cuneate, 4—14 cm. long, glabrous, subglabrous, or densely pubescent along the nerves, 3 tripartite, middle segment trifid, lateral bifid, all serrate; involucres of second order 1--3-leaved, leaves 3-cleft, densely villous at base; involucral leaves of the third order 1—2-leaved, 2—3-fid sparsely serrate; involucral leaves $\frac{1}{3}$ to $\frac{1}{2}$ the size of those of the next higher order. Peduncles of first order 8—30 cm. long, very slender, glabrous or slightly hairy, base usually densely villous; secondary peduncles 2—8, rarely all of them simple, usually the central one and one or two others simple, the remainder umbel-bearing, rather unequal in length. Pedicels pretty slender, slightly puberulous to densely silky-pubescent. Sepals 5, obovate, 9—20 mm. long, $\frac{1}{2}$ to $\frac{2}{3}$ as broad, white, glabrous. Stamens 50—70, unequal, the longest ones $\frac{2}{5}$ to $\frac{3}{5}$ of sepals; filaments complanate, the outermost rarely filiform, linear; anthers cordate-subrotund, 1·2—1·8 mm. long. Pistils 10—15, sessile, 3—3·5 mm. long, glabrous; ovaries compressed to nearly flat, ovate to oblong, slightly oblique, narrowly or broadly marginate; style slightly tapering into the obtuse stigmatose apex, from $\frac{1}{2}$ to nearly $\frac{1}{1}$ of ovary. Achenes usually only few (1—3, sometimes 6) attaining maturity, flat, elliptic or elliptic-oblong, nearly symmetrical on ateral aspect, rather narrow-margined, about 1 cm. long, persistent style rather central, permanent basal part short, straight or nearly so, not reflexed and nearly contiguous to achene. Seeds and sides of achenes longitudinally ribbed.

Flowers in July.

Garhwal, 9—10,000′ near Rāmri (*Duthie!*); Kumaon, 9—10,000′: in forests near Sosa, Shinko-ta (*Duthie!*); Nipal; Khasia, 5,000′ (*Hooker*).

From the form of *A. polyanthes* with compound umbels this is pretty easily distinguished by the rarer indumentum, the less regular umbels and umbellules, the subcentral and straight persistent style, and the distinctly ribbed seeds. A plant, in nearly every respect like *A. elongata*, but with one-sided and recurved persistent style, was gathered by Maingay in Northern China on the Shan-tung range (3,500'). It is not referred to in Hemsley's Enumeration. The specimens of Wallich's *Anemone curta* and *Anemone geraniifolia* in the Calcutta Herbarium are umbellules of either *Anemone elongata* or of the compound form of *Anemone polyanthes*. *Anemone polyanthes* is completely linked with *A. narcissiflora* by numerous intermediate forms from Turkestan, Tibet, and Northern Sikkim; it must therefore be reduced to the rank of a subspecies of *A. narcissiflora*.

PLATE 108. *Anemone elongata*, Don. 1, sepal; 2, stamens: (*a*) outer, (*b*) middle, (*c*) inner; 3, pistils: (*a*) outer, (*b*) innermost; 4, achenes: (*a*) and (*b*) from *Khasia*, (*b*) half of pericarp cut away to show the seed; (*c*) *N. W. Him.*, unripe; (*d*) *China* Maingay's specimen referred to in the text; (*e*) of *A. polyanthes* var. *longipedunculа*, *P. B.*, *Sikkim*; (*f*) of *A. polyanthes* typica, *Kumaon*; (*g*) the same, *Sikkim*; (*h*) of *A. narcissiflora*, Pyrenees. 5, *a—d*, *A. geraniifolia*, Wall. Cat. 4693 in Herb. Calc., (*a—c*) stamens, (*d*) pistil; (*e*) pistil of *A. rivularis*. 6, *A. curta*, Wall. Cat. 4690 in Herb. Calc., *Sylhet*, stamens and pistil; 7, *A. rivularis*, Wall. Cat. 4692, *Nipal*.

ADONIS BREVISTYLA, *Franchet*, var. TRICHOCARPA, *P. B.*

The plant figured on plate 109 belongs to the group of species of which *A. cærulea*, Maxim., *A. Davidi*, Franchet, and *A. brevistyla*, Franchet, are members. The latter two are known to the writer only from Franchet's lucid descriptions and the accompanying figures. Our plant differs from *A. Davidi* by the stem being 40—50 instead of 20—30 cm. long, by the leaves being rather distant, the lower internodes being 7·5—11 cm. instead of 5–7 cm. long, by the vagina of the lowest leaves being 1 cm. or less instead of 2·5—3 cm. long, by the lateral branches being 10—20 cm. instead of about 5 cm. long, by the uppermost leaves being considerably smaller than the lower ones, by the petals being apparently smaller (13—15 instead of 16—22 mm.) and more or less sulphur-yellow instead of bluish.

The chief differences appear to be in the more slender habit of our form, in the shortness of the sheaths of the lower leaves, and the colour of the petals. From Franchet's *A. brevistyla* it differs by the leaves not being densely crowded, by the sheaths of the upper leaves being short, by the segments of the first order being ovate-oblong or ovate-lanceolate in outline and not ovate-deltoid, by the number of sepals being 5 instead of 6—7, by the ovaries being hairy and not glabrous, and by the style not being very short in comparison with the ovary during flowering. The affinity to *A. cærulea*, Maxim. appears to be much less close. The following is a detailed description of our plant.

A perennial herb, glabrous except the ovaries, 30—50 cm. high when in flower. Rhizome descending, subcylindric, covered at the apex with oblong obtuse scales. Stem erect, straight or flexuose, slender, obtuse-angled, simple or oftener branched upwards, leafy from near the base, 2—3 mm. thick near base; branches 0—3, spreading, very slender, leafy, often overtopping the main axis. The leaves may be considered as sessile or nearly so, the lower pinnæ being inserted near the base, but very small and of the appearance of stipules; petioles dilated into a short sheath, half-stem-clasping; suprabasal pinnæ in outline ovate-oblong, below bipinnatisect, lower 10—16 × 4—7 cm., uppermost 2—5 cm. long; rhachis canaliculate, lower pseudo-petioles 4—9, upper 2—7 cm. long; leaf-segments opposite, subopposite, or alternate; lowest primary segments (pinnæ) springing from the vagina, ovate or subrotund in outline, 5—18 mm. long; the others ovate-lanceolate; secondary ones sessile ovate-oblong and lanceolate in outline; laciniæ lanceolate, mucronate, incised or quite entire. Inflorescence centrifugal. Flowers terminal on main axis and branches; peduncle 5—30 mm. Sepals 5, subequal in length, unequal in breadth, membranous, greenish, with branched nerves, elliptic-oblong or one or the other obovate-oblong,

subacute, 8—11 mm. long, 3—4·3 mm. broad, at the margin often microscopically papillose. Petals 7—13, $\frac{6}{5}$ to twice as long as the sepals, with 3 repeatedly divided nerves (nervelets subparallel), cuneate-obovate, obtuse or subrotund at the apex, 12—15 mm. long, 4·5—5·5 mm. broad, white, yellowish near the base. Stamens 30—40, unequal in length, filaments of inner stamens shorter, about 3 mm. long, plane, dilated towards the base, outer 3·7—5 mm. long., narrow-linear, scarcely widened below; anthers equal, oblong-elliptic, blunt, about 1·5 mm. long, laterally dehiscing. Pollen globose. Pistils 15—30, inserted on a short-cylindric torus, forming a globose head; ovaries biconvex, margined, ventrally gently curved, dorsally very convex, ciliate, on the sides puberulous; dorsal nerve simple, ventral divided a little above the bifurcation of the basal nerve, in two branches, the right one of which, seen dorsally, is ovule-bearing, the left one sterile; style shorter than the ovary, apex recurved, stigmatiferous on ventral suture. Ovule hemianatropous, inserted with a broad base, with two integuments, micropyle directed towards the base of the ovary. Achenes rather numerous, sessile, gathered into a globose head of 1 cm. diameter, asymmetrically obovoid, the ventral suture being nearly straight, the dorsal one very convex, about 5 mm. long, ventrally keeled, rugulose on the sides, puberulous, style hooked, much shorter than the achene proper.

PLATE 109. *Adonis brevistyla*, Franch., var. *trichocarpa*. 1, sepal; 2, petal; 3, inner stamen; 4, outer stamen; 5, pistil; 6, the same, one-half of the pericarp removed; 7, pistil, dorsal aspect; 8, section through ovule; 9, ripe carpel; 10, longitudinal section through the same; 11, outer epidermis with hair from ripe carpel; 12, group of sclerenchyma cells from ripe carpel.

RANUNCULUS AUCHERI, *Boiss.*

Root-fibres thin-cylindric; leaves subisodiametric, trisect; segments usually petioled, deeply cut, more rarely only lobate; longer laciniæ mostly linear; flowers solitary or few or forming a many-flowered, often divaricate corymb; sepals spreading, persistent; nectariferous staminodes broad obovate, subasymmetric, about 1 cm. long, persistent; nectarial scale free, conspicuous; gynæcium ovoid; ovaries flat, broadly semi-ovate or semi-obovate, dorsally very convex, subabruptly attenuated into the style, glabrous or more or less beset with stiffish hairs; style hooked at the tip; achene compressed, glabrous or somewhat hairy, smooth.

Flowers in May and June.

Distribution: Persia, Afghanistan.

The Afghan specimens vary considerably in the thickness of the root-fibres, in the relative length of style and ovary, and in the degree of division of the leaves. It will therefore be preferable to reunite *R. elbrusensis* with *R. Aucheri*. *R. eriocarpus*, Boiss, too, is hardly more than a form of *R. Aucheri*. Taking the latter to be a good species of the first order because of its tomentose carpels, we arrive at the following arrangement.

Subspecies I. ELBRUSENSIS, *Boiss.*; root-fibres oblong cylindric; leaves trisect; segments sessile; laciniæ subacute; ovaries hairy, about twice the length of the style.—Elbrus.

Subspecies II. AUCHERI TYPICUS; root fibres thin-cylindric; leaves trisect, at least the terminal segment petiolulate; laciniæ mostly subacute; ovaries hairy or glabrous; style $\frac{1}{3}$ to $\frac{1}{4}$ the length of the ovary.

Var. α. BUNGEANA, *Boiss.*; leaf-segments only lobed.—Persia.

Var. β. PERSICA; leaf-segments tripartite or trisect; flowering plant 30—50 cm. high; inflorescence many-flowered, corymbose; style usually about as long as the ovary.—Southern Persia (*Kotschy!*).

Var. γ. SIKARAMENSIS, *P. B.*; leaf segments tripartite or trisect, often subpinnately cut flowering plant 2—12 cm. high; inflorescence 1-, more rarely 2-flowered; style ⅓ to ¾ the length of the ovary. Sikaram, 12,600′ (*Aitch!*).

Subspecies III. HARIABENSIS, *P. B.*; root-fibres slender, cylindric or fusiform; leaves twice trisect; segments of the first order long-, of the second order short-petioluled, the latter deeply cleft, laciniæ narrow-oblong, obtuse or rounded, small; ovaries broadly semi-ovate, glabrous; style about ¼ the length of the ovary. Kurrum, on the mountains bordering the Hariab valley, 10,000′ (*Collett!*). Flowers in May.

PLATE 110. (A) *Ranunculus Aucheri*, Boissier, subsp. *typicus*, var. *persicus*. (B) *R. Aucheri*, subsp. *typicus*, var. *sikaramensis*. (C) *R. Aucheri*, subsp. *hariabensis*. 1, sepal of *R. hariabensis*; 2, nectarial staminodes of (A), (B), (C); 3, stamen of *R. hariabensis*; 4, pistils of (A), (B), (C).

RANUNCULUS AFGHANICUS, *Aitch. et Hemsl.*

Thicker root-fibres stout-filiform or fusiform; flowering stem 5—25 cm. high, silky villose; basal leaves rather long-petioled, blade reniform, cordate, 1·5—3 cm. across, trilobed to about ⅓ to ½, glabrous; middle lobe cuneate-obovate, lateral ones trapezoidal, much broader, unequally bilobed; lobes and lobules crenate; inflorescence one-to many-flowered; peduncles patulous or ascending; bracts trisect, segments linear or oblanceolate, obtuse; sepals patent, elliptic or obovate-oblong, villose; nectariferous staminodes about 1 cm. long, at least twice as long as the sepals and androgynoecium, broadly asymmetrically obtriangular, like the sepals persistent (always?); nectarial scale free, conspicuous, obtriangular; filaments and anthers linear; pistils numerous, 1·5—2 mm. long, compressed, broadly semi-ovate; glabrous or sparsely beset with stiff hairs, dorsal nerve little remote from the margin; style about ½ as long as the ovary, emerging from it rather abruptly; achene compressed, semi-obovate, very convex dorsally, style hooked, much shorter than the achene proper.

Flowres in June.

Afghanistan: Kurrum valley: on grass-meadows. Karchatal 10,500′ (*Aitch.!*); mountains of the Hariab valley, 8—9,000′ (*Collett!*).

Regel's description of his *Ranunculus Olgæ* (1882) from Autshi-Dagana, Turkistan, agrees entirely with that of the Afghan specimen of *R. afghanicus*.

PLATE 110*A*. *Ranunculus afghanicus*, Aitch. et Hemsl. 1, Tall; 2, dwarf specimen; 3, sepals; 4, nectarial staminodes; 5, stamen; 6, pistils; 7, pistil of *R. Sprunnerianus*, *Boiss.*; 8, achene of the same.

CALATHODES PALMATA *H. f. et T.*

The genus *Calathodes* has been reduced by Baillon and Prantl to the rank of a subspecies of *Trollius*. And, indeed, as long as the generic separation had to be chiefly based on the presence or absence of the so-called petals, and as the latter are sometimes reduced to three in *Trollius pumilus*, the reduction of *Calathodes* to *Trollius* appeared unavoidable. Recently, however, ripe fruits of *Calathodes palmata* have been gathered, and their examination shows that *Calathodes* is really a good genus. For it is found that in the latter genus the torus elongates after flowering by an interstitial growth of the tissues between the insertion of the sepals and that of the carpels. That we have not to deal with a coalescence of fruit-stalks, as has been supposed, is clearly proved by a cross-section through the elongating part of the torus (see fig. 12 of plate 112). In the Western Chinese plants the ovaries have a wing-shaped cellular outgrowth near their base, the lower portion

of which becomes involved in the interstitial growth of the torus, so that the angles of the latter become winged; in the Sikkim specimens this wing-like appendage is, however, wanting, so that it cannot be made use of as a generic character; it is hardly of sufficient importance to found a separate species on. If *Caltha* be upheld as a genus the definitions of *Caltha*, *Calathodes*, and *Trollius* would be as follows:—

Caltha, Linn.; leaves entire; nectariferous staminodes none; torus between the insertion of the calyx and the gynœcium not elongating after flowering; seeds usually inserted all along the ventral suture; chalazal part of seeds more or less spongy.

Calathodes, H. f. et T.; leaves palmately divided; nectariferous staminodes none; torus elongating after flowering between the insertion of the calyx and the head of follicles; seeds inserted below the middle, chalazal part not spongy.

Trollius, Linn.; leaves palmately divided; nectariferous staminodes present; torus not elongating by interstitial growth; seeds inserted all along the ventral suture of the follicles, chalazal part not spongy.

Varieties of *Calathodes palmata*—

Var. *a.* ANARTEMA, *P. B.*; ovaries exappendiculate. (Flowers solitary.) Sikkim, 10,000′ (*Hooker fil !*).

Var. *β.* APPENDICULATA, *P. B.*; ovaries and follicles dorsally with a wing-shaped appendage near the base. Inflorescence racemose or paniculate. Hupeh (*Henry*, 1885-86, *No.* 6977 !) See also Hooker's Icones, plate 1935.

PLATE 112. *Calathodes palmata*, H. f. Th. 1, flowering plant from Sikkim; 2, head of follicles of variety *β*; 3, sepal; 4, stamens; 5, gynœcium of variety *a*; 6, pistil of variety *a*; 7, the same, with the ovary cut longitudinally; 8, pistil of variety *β*; 9, the same cut longitudinally; 10, a pistil less magnified; 11, head of ripe follicles seen from above; 12, cross section through torus below head of follicles; 13, ripe seed; the figure at the lower right edge represents a ripe follicle just before dehiscence.

TROLLIUS PUMILUS, *Don.*

The genus *Trollius* is composed of two form-groups—one group which is characterized by the nectariferous staminodes being usually long-clawed, and more especially by their being distinctly thickened at the upper edge; whilst the staminodes of the second group have a very short claw and their upper margin is thin, like the margin of an ordinary petal. The former comprises the various varieties of *T. pumilus*; to the latter belong the difficultly separable species *T. europaeus*, *T. asiaticus*, *T. laxus*, and *T. lilacinus*, with their subspecies *T. altaicus*, *T. acaulis*, and others. According to Maximowicz the discrimination of the Northern Asiatic and European species would be according to the following scheme:—

A. Flores lilacini ... ... *T. lilacinus.*
B. Flores flavi vel aurantiaci—
  a. Styli discolores ... ... *T. altaicus.*
  b. Styli concolores—
    a. Petala stamina superantia ... *T. asiaticus.*
    β. Petala staminibus subæquilonga vel iis subbreviora ... ... *T. laxus.*
  γ. Petala staminibus breviora ... *T. europaeus.*

The relative length of stamens and staminodes is, however, an unreliable character, even in *T. asiaticus.* This is shown by figures *l*, *m*, *n*, of which *l* is from an old specimen of Schangin's and *n* is from a specimen on the same sheet and in nearly every respect exactly like the former; but whilst in *l* the stamens are distinctly longer than the staminodes, in *n* the staminodes are about twice the length of the stamens; *m* is from another old Siberian specimen of *T. asiaticus* in

which the staminodes are only slightly longer than the stamens. In *T. europaeus* the staminodes appear always to be a little shorter than the stamens; they are also more distinctly obovate. After all it may be better to fall back on Linnæus' way of distinguishing *T. europaeus* from *T. asiaticus* by the sepals being connivent in the former and patulous or spreading in the latter, although it must be confessed that this method has its difficulties. Regel's *T. dshungaricus* will then have to be separated again from *T. europaeus*. Its affinities are perhaps more with *T. laxus*. The character by which *T. altaicus* is separated from *T. asiaticus* is hardly of sufficient weight to prevent its being considered a subspecies of the latter.

Of how little importance the relative length of ovary and style as a diagnostic character may be, is exhibited by fig. 5 *g* to *k*, all of which are from Siberian and doubtlessly good specimens of *T. asiaticus*; compare, for instance, *h* with *k*. This has an important bearing on *T. acaulis* as a species of the first order. Here the pistil has very commonly the shape depicted in fig. 5, *e*; but in a specimen, for instance, from Phulaldaru in the Nila valley the pistil is exactly like 5, *b*, which represents the pistil of *T. americanus* Mühlb. from North America. Although the majority of specimens of *T. acaulis* are similar to those described and figured by Lindley in the Botanical Register of 1842 and 1843, the name has become singularly inappropriate, since leafy specimens as much as half a meter in height have been gathered in the North-West Himalaya. As a rule the Siberian forms of *T. laxus* have the blade of the staminodes linear-oblong (see fig. 8, *h*), whilst in *T. acaulis* they are usually obovate or obovate-oblong (see 8, *d, e, f, g*); but in the American varieties of *T. laxus*, the nectariferous staminodes are like those of acaulis. As a matter of fact, *T. acaulis* is connected with *T. laxus* by a series of intermediate forms, especially from Gilgit, some of which are hardly distinguishable from the true *T. laxus*. That *T. patulus* and *T. caucasicus* are nothing but varieties of *T. laxus* is pretty generally admitted.

Much importance should not be attributed to the persistence or otherwise of the sepals; they are very commonly so in *T. pumilus*, but the character is not a constant one; the sepals of *T. acaulis* are mostly deciduous, but specimens may be observed in which the head of ripe follicles is accompanied by marcescent sepals The relative length of ovary and style is freely made use of by Ledebour, but the character is of little value, for we find the length of the style in terms of the length of the ovary to be in specimens of *T. asiaticus*—⅔, ½, ¼, ⅘.

Remarkable is the close resemblance of *T. lilacinus* to the typical *T. acaulis*; the colour of the sepals of *T. lilacinus* would hardly prevent its being united with *T. laxus*, the more so as the sepals of *T. americanus* are suffused with a pinkish hue on the outside, and in the variety *alba* from the Rocky Mountains they are white. The only character by which it is possible to distinguish *T. clilacinus* from all the other species of *Trollius* is the absence of glandular papillæ on the pistils, a character which, however, is hardly of sufficient value to make it a subspecies as is done by Prantl. We would thus arrive at the following grouping of the various forms of *Trollius*:—

I. Staminodes manifestly thickened at their upper edge, with long claws.—*T. pumilus*, Don.

II. Staminodes quite petaloid, flat at their upper margin, with short claws.

A. Sepals patulous or spreading:—

a. Staminodes shorter or somewhat longer than the stamens, obovate or obovate-oblong.

α. Carpels papillose. Sepals yellow or white.—*T. laxus*, Salisb.

β. Carpels glabrous. Sepals lilac.—*T. lilacinus*, Bunge.

b. Staminodes mostly distinctly longer than the stamens, linear or linear oblanceolate or style of a different colour to the ovary.—*T. asiaticus*, Lin.

B. Sepals connivent, staminodes usually somewhat shorter than the stamens.—*T. europaeus*, Linn.

We now pass on to a more detailed description of the forms which constitute the species *T. pumilus*.

Subspecies.

Subspecies I. ANEMONIFOLIUS, *P. B.*; stem sparsely foliate; blade of basal leaves trilobed to near the base, usually 3—5 cm. long; the segments sub-distant; the middle

one deltoid or broadly obovate, breadth $\frac{3}{4}-\frac{8}{9}$ the length, nearly to $\frac{1}{2}$ trilobed; lobes lobulate or serrate-crenate, lobules distantly or closely crenate-serrate, serratures apiculate or submucronate; staminodes 6–7 mm. long, linear, breadth about $\frac{2}{9}-\frac{1}{8}$ the length. Kansu (*Potanin !*); Tachienlu region (*Pratt* n. 676 !).

Subspecies II. Pumilus normalis; stem mostly leafless above the base, rarely 1—2-leaved; blade of basal leaves 1—3 cm. long, trilobed beyond the middle or nearly to the base, usually more or less overlapping upwards; middle segment in outline broadly and often subspatulately obovate or broad-deltoid, breadth $\frac{6}{7}-\frac{1}{1}$ the length, usually trilobate or subtrifid to $\frac{1}{3}$ or nearly $\frac{1}{2}$; lobes lobulate or subincisedly serrate, serratures mostly frequent and close together, acuminate-mucronate or nearly aristate, rarely apiculate only; lamina of staminodes linear-oblong, often compressed-capitate at the apex, breadth $\frac{1}{4}-\frac{2}{5}$ of length.

Subspecies III. geranifolius, *P.B.*; stem usually 1- to 2-leaved; petioles of cauline leaves conspicuously sheathing; leaves deeply 3-partite or 3-sect; blade of basal leaves 1—3 cm. long, segments often rather distant; middle segment oblong-elliptic or elongate-deltoid in outline, breadth $\frac{3}{5}-\frac{3}{4}$ the length, usually trifid beyond the middle; laciniæ once or twice incised or incised-serrate; lacinulæ or serratures rather scarce, usually lanceolate or lanceolate-linear, apiculate, entire or serrulate; basal sinus usually narrow; staminodes 3—4 mm. long, blade obovate or obovate-oblong, breadth $\frac{1}{4}-\frac{1}{3}$ the length.

Subspecies II. Pumilus normalis.

Var. α. sikkimensis *P. B.*; leaves with numerous mucronate serratures; flowering stem 8—15 cm. high, leafless or rarely with one leaf near the base.—Sikkim 15—17,000′ (*Hook. fil. !*); Phāri (*K.'s coll. !*); Bhutan, near Kung-met (*K.'s coll. !*).

Var. β. bhotanica, *King in herb. Calc.*; stem 30 to 40 cm. high, one-flowered, leafless or rarely with one leaf towards the base; leaves as in *a.*—Chumbi, at Do-tha (*K.'s coll. !*).

Var. γ. yunnanensis, *Franchet Pl. Del.*, *p.* 23; stem up to 50 cm. high, often three-flowered, with one or two cauline leaves; basal leaves as in *a.*—(Yunnan.)

Var. δ. ranunculoides, *Hemsley pro sp. in Linn. Soc. Journ.*, *No.* 202, *p.* 301; stem 10—24 cm. high, leafless; laciniæ of basal leaves once or scarcely twice serrate, serratures apiculate, segments more or less overlapping, basal sinus closed.—Tachienlu region (*Pratt* !).

Var. ε. kansuensis, *P. B.*; stem 15—20 cm. high; one-leaved near the base; leaf-segments distant, laciniæ once serrate, serratures apiculate.—Kansu (*Potanin*).

Var. ζ. tangutica, *P. B.*; stem 7—10 cm. high, leafless; segments more or less imbricate, lobulate; lobules rounded, once crenate-serrate, serratures scarcely apiculate.—Tangut region of Kansu (*Przewalski !*).

To judge from Don's description, his *T. pumilus* is identical with our subspecies *geranifolius.* Of great interest in connection with the real nature of the so-called petals is the occurrence in var. *bhotanica* of undoubted staminodes, consisting of filaments of varying lengths and an ellipsoidal empty terminal pouch; the number of so-called petals is then reduced to three or four (see fig. 5*d*). This proves conclusively that Prantl's opinion that the nectariferous petals in *Trollius* and other genera of Ranunculaceæ are really modified stamens, is correct. In subsp. *geranifolius* especially the sepals are very often persistent and marcescent (see fig. 6), whilst in *T. acaulis* they are usually caducous; but

even in this form persistent sepals are here and there met with, which shows how worthless this character is as a generic, or even specific, mark.

Note—Erase the figure 5 beneath the pistil marked k, mark the pistil in the lower right corner with the letter m, and change the second letter e into l.

PLATE 113. *Trollius pumilus*, Don. var. *geranifolius*. 2, leaves of (*a*) *T. pumilus normalis* var. *sikkimensis*, Sikkim; (*b*) ditto from Bhutan; (*c*) var. *kansuensis*; (*d*) var. *tangutica*; (*e*) var. *ranunculoides*, Tachienlu region; (*f*) *T. geranifolius*. var. *connectens*, Sikkim; (*g*) ditto, large-leaved form; (*k*) subsp. *anemonifolius*, Tachienlu region. 3, sepals of *geranifolius*. 4, staminode, stamen, and pistil of *T. pumilus sikkimensis*; 5, staminodes of (*a*) subspecies *normalis sikkimensis*; (*b*), (*c*) subspecies *geranifolius*, Chumbi; (*d*) var. *bhotanica*, Chumbi; (*e*) subspecies *anemonifolius*, Tachienlu; (*f*) subspecies *normalis* var. *ranunculoides* 6, head of follicles of subsp. *geranifolius*. Seeds 7, (*a*) of *T. pumilus sikkimensis*, (*b*) unripe seed of *T. geranifolius*; (*c*) ripe seed of *T. acaulis*; 8, stamens and staminodes of (*a*) *Trollius americanus*, Mühlb., E. States of N. America; (*b*) ditto, of var. *albiflora*, A. Gray, Rocky Mountains; (*c*) *T. laxus*, Gilgit; (*d*) *T. acaulis*, Kampingra; (*e*) ditto, Kumaon; (*f*) ditto, Chamba; (*g*), ditto Boran pass; (*h*) *T. davuricus*, Turcz. = *T. laxus*, Dahuria; (*i*) *T. lilacinus*, Bge. Ili; (*k*) *T. europaeus*, Germany; (*l*) *T. asiaticus*, Siberia (*Schangin*); (*m*) ditto, apparently from the same locality; (*n*) ditto, Siberia, (*o*) *T. altaicus*, Altai. 9, pistils of (*a*) *T. laxus*, Gilgit; (*b*) *T. americanus*, N. America; (*c*) *T. laxus*, Dahuria; (*d*) *T. laxus*. var. *albiflora* Rocky Mountains; (*e*) *T acaulis typicus*, N.-W. Him.; (*f*) *T. lilacinus*, Bge.; (*g*) *T. asiaticus*, Siberia; (*h*) ditto; (*i*) ditto, Irkutsk; (*k*) ditto, Siberia; (*l*) *T. Ledebourii*, Mongolia; (*m*) *T. chinensis*, Mongolia; (*n*) *T. altaicus* Altai.

COPTIS TEETA, *Wall.*

There is little to be added to Wallich's description of this plant in the Transactions of the Medical and Physical Society of Calcutta (vol. VIII). Wallich calls the carpels "breve stipitata," but his follicles were not ripe, and the pistil is always only very shortly stipitate; when ripe the stipes is about as long as the follicle, as seen from fig. 1. The specimens figured on plate 114 were grown in Mr. Mann's garden in Shillong. The Chinese plants are evidently exactly like them.

PLATE 114. *Coptis Teeta*, Wall. 1, fruiting specimen; 2, upper part of flowering scape; 3, outermost; 4, innermost sepal; 5 and 6, petals; 7 and 8, stamens; 9, pistil; 10, ripe follicle, part of stipes cut off; 11, seed.

COPTIS OSPRIOCARPA, *Paul Brühl.*

Quite glabrous. Rhizome stout-cylindric or subtuberiform, horizontal, covered at the apex with triangular subcarnose scales. Stem slender, erect, 50—80 cm. high (perhaps even higher), terete, striated, solid, 3—4 mm. thick near the base, leafy. Internodes 10—12 cm. long below. Leaves very large, much paler beneath, subtriternatisect, gradually but distinctly decreasing in size upwards; blade deltoidal in outline; nerves slender, more distinct beneath; petiole somewhat shorter than the blade, dilated at the base into a short (1 cm. and less), ovate, membranous sheath, canaliculate on the upper surface, striated (when dry), lower 8—10, uppermost 3—4 cm. long; primary segments ovate-oblong in outline, apparently pinnately divided, rather long petioluled; petiolules slender, middle one about twice as long as the lateral ones, 8 cm. in the lower, 2 cm. in the uppermost leaves; segments of the second order petioluled; middle petiolule in the lower leaves 1·5—3 cm., lateral ones 3—10 mm. long; lateral segments of the second order somewhat oblique, suborbicular or broadly ovate in outline, trisect to trifid or unequally bipartite, terminal partition obovate or rhombic, lateral ones trapezoidal: terminal segment of the second order cordate-ovate in outline, subpinnately cleft; lower divisions nearly to the base, more or less obliquely lanceolate-oblong, upper ones linear-oblong; divisions of the third order pinnately cleft and

incised, lacinulæ unequally serrate; serratures callose-apiculate; upper leaves slightly less divided, uppermost often reduced to a small, ovate-lanceolate, very acute scale. Flowers unknown. Infructescence racemose, 20—30 cm. long. Bracts deciduous. Heads of follicles about 6, lower consisting of 3, upper often of 2 or 1 follicle. Peduncles elongating, at first about 5, finally 10—15 mm. long, about 0·7 mm. thick, terete, torus forming a small knob. Follicles stipitate; stipes subterete, striated, thin, finally 10—12 mm. long; follicle proper cylindric. attenuated into the base, terminated by the short persistent style, without stipes 3—4 cm. long, membranous, finely reticulate; sutures narrow, not prominent; persistent style little more than 1 mm. long, stigmatic surface thick, extending along the ventral suture, slightly recurved at the apex, seeds numerous, obovoid.

Eastern Sikkim: at Nūtat; Phari (*Dungbu !*).
Flowers just fallen in July; fruit ripens in August.

This species agrees with *Coptis brachypetala*, Sieb. et Zucc., in the biternately divided leaves with pinnatifid segments, the partitions being again pinnatifid or incised-serrate, the serratures being acute. The authors state, however, that this species has long pedicelled flowers and that "habitus omnino ut in *C. asplenifolia*, DC., sed segmenta foliorum profundius incisa, lobis plerumque augustioribus et minoribus." In our species the lobes are much larger than in *C. asplenifolia*; in fact as regards the vegetative parts it stands nearer *C. Teeta* than *C. asplenifolia*. From both it differs widely in the size and shape of the follicles.

C. anemonæfolia, Sieb. et Zucc., differs in the leaves being ternatisect instead of biternately divided, and the peduncles being twice as long as the fruit.

Indeed, an examination of the figures in Phonzo Zoufou, Vol. VII, proves clearly that our plant does belong to neither *C. anemonæfolia* nor to *C. brachypetala*. It is, however, very closely related to *Coptis orientalis*, Maxim. To judge from Maximowicz's description and Phonzo Zoufou's fig. tab. II versa, which Professor Huth doubtfully refers to *C. orientalis*, the leaves of the two species are nearly identical. A further point of agreement between the two consists in the size of the follicles and the relative length of stipes and follicle proper. Professor Huth states that the follicle of *C. orientalis* is about 30 mm. long of which nearly 10 mm. are accounted for by the stipes. The longest follicles in our species are about 45 mm. long, the stipes being 12—15 mm. The only essential difference between *C. ospriocarpa* and *C. orientalis* rests on the comparative length of fruit and pedicel. Maximowicz lays considerable stress on the relative length of fruit and pedicel. For he says :—"C. anemonæfolia a C. orientali differt pedunculis fructum ad summum duplo, in nostra (C. orientali) triplo quintuplove superantibus.' In *C. ospriocarpa* the longest fruit-bearing pedicels are 17 mm. long, and about one-third the length of a stipitate follicle, but usually they are only ½ or less. *C. orientalis* appears to have five or more carpels in one head. Our species has never more than three. There may, of course, exist other differences in the parts of the flower.

PLATE 115. *Coptis ospriocarpa*, P. Brühl, fruiting specimen from Sikkim; 1, very immature follicle; 2, ovary cut open; 3, seed; 4, scale from below inflorescence.

DELPHINIUM.

Although it may be a matter of convenience to retain *Aconitum* as a separate genus, the characters which distinguish it from *Delphinium* are of so little weight that we cannot help agreeing with Baillon, who unites the two. On the one hand the posterior sepal of the extreme forms of *Aconitum Lycoctonum* is truly spurred, whilst in *Delphinium Hohenackeri* and allied forms it is more helmet-shaped than in many an aconite. The only character which can be used to separate all the forms of *Aconitum* from those of *Delphinium* is the existence of a well-developed claw in the nectaries, the claw being never shorter than

the cucullus and usually longer; whilst in *Delphinium* it is only indicated and in only a few species is there a distinct rudiment of one. With our present knowledge of *Delphinium* and *Aconitum* it is doubtful whether any botanist could be found who would consent to a generic separation of the two, if they had been originally united. It is certainly as reasonable to establish *consolida* as a separate genus as it is to allow *Aconitum* generic rank. *Delphinium* would then be distinguished from the other *Helleboreae* by its monosymmetric flowers and the form of its nectaries, and it would be divided into the three subgenera—

I.—CONSOLIDA; nectaries coherent into one, rarely abortive; carpel solitary.

II.—DELPHINIUM VERUM; nectariferous staminodes 2, separate, claw absent or rudimentary; carpels 3—8.

III.—ACONITUM; nectariferous staminodes 2, separate, claw at least as long as the nectary proper; carpels 3—8.

The arrangement of the species belonging to *Delphinium verum* into sections that leave closely allied forms together, is a matter of great difficulty, and is in some cases impossible. The following classification, to a certain extent foreshadowed by the lamented Professor Prantl in "Die Pflanzenfamilien," is here attempted. A different grouping will, according to a friendly communication of Professor E. Huth, be adopted by him in his monograph on *Delphinium*, which will shortly be published in Engler's Jahrbücher, and which will for a long time to come form the standard work on this highly interesting genus.

Section I.—DELPHINELLÆ; annual; anterior staminodes glabrous; seeds either depressed-spherical, the wrinkles forming an open cup at the top (*Delphinellæ propriæ*), or triangular-subglobose, areolate-rugose (*Staphisagreæ*).

Section II.—ISOCHEILÆ; perennial; anterior staminodes hairy, similar in colour to the sepals, usually about as long as, or longer, rarely (in *D. incanum*) 3 mm. shorter than the anterior sepals, light coloured, usually bifid; seeds lamellate-rugose; cauline leaves usually conspicuously sheathing. To this section belong—*D. dasystachyum*, Boiss.; *D. lanigerum*, Boiss.; *D. ithaburense*, Boiss.; *D. micranthum*, Boiss; *D. hybridum*, Willd., with its subspecies *D. fissum*, Waldst. et Kit., *D. hybridum verum*, *D. cyphoplectrum*, Boiss.; *D. quercetorum*., Boiss. *D. Szowitzianum*, Boiss.; further *D. incanum*, Royle; *D. denudatum*, Wall.; *D. tuberosum* Auch.; *D. penicillatum*, Boiss.; *D. kurdicum*, Boiss.; *D. Zalil*, Aitch. et Hemsl.; *D. saniculaefolium*, Boiss.; *D. uncinatum*, H. f. et T.; *D. dasycaulon*, Fresen.

Section III.—HOMŒOCHROÆ; perennial; anterior staminodes hairy, similar in colour to the sepals (blue, more rarely purple), distinctly and usually much shorter than the anterior sepals, lamina usually orbicular or oval, entire or bilobed; seeds not lamellate-rugose, sometimes nearly smooth, usually with the epidermis more or less loose, especially along the edges; cauline leaves usually scarcely sheathing. Of Indian *Delphinia* the following belong to this section:—*D. grandiflorum*, Linn., incl. *D. cæruleum*, Jacq.; *D. cheilanthum*, subspecies *schizophyllum*, P. B.; *D. altissimum*, Wall.; *D. pachycentrum*, Hemsl., subsp. *tsangense*, P. B.

Section IV.—HETEROCHROÆ; perennial; anterior staminodes hairy, very different in colour from and shorter than, the (blue, purple, or variegated) sepals, usually purplish-black or chestnut-brown, rarely white or yellow, lamina ovate, usually bifid, with lanceolate-acute segments, rarely roundish and emarginate or bilobed; seeds various; cauline leaves often scarcely sheathing. This is divisible in two subsections, which, when our knowledge of the structure of the seeds has been completed, will probably form two separate sections or series.

Subsection 1.—PTEROSPERMÆ; seeds with the loose epidermis forming wings along the edges, epidermis otherwise more or less puckered, but not thrown into scariose wrinkles.—*D. stapeliosmum*, P. B.; *D. elatum*, Linn. subspecies *incisum*; *D. vestitum*, Wall.; *D. viscosum*, H. f. et T.; *D. glaciale*, H. f. et T.; *D. Brunonianum* Royle, *D. densiflorum*, Duthie.

Subsection 2.—LEPIDOSPERMÆ; seeds lamellate-rugose.—*D. speciosum*, M. Bieb., subspecies *ranunculifolium*, Wall.; *D. kashmirianum*, Royle, and *D. Jacquemontianum*, Camb.

As specimens with ripe fruits are yet rather scarce, partly in consequence of the tendency with paid collectors and amateur botanists to neglect gathering fruits and ripe seeds, partly from the necessity of leaving less accessible regions before the fruits have attained maturity, it is not yet possible to establish in all cases the limits within which the structure of the seed has to be considered as variable. For instance, it would be very interesting to know whether of two species like *Delphinium Brunonianum* and *Delphinium Jacquemontianum*, which agree with each other nearly in every detail, one is a direct offspring of the other, or, what in some respects is more probable, whether they constitute corresponding members of two parallel series, one with its winged seeds a descendent of *D. elatum*, the other a modification of *D. speciosum*. There is no genus among *Ranunculaceæ*, except perhaps *Isopyrum*, where an accurate knowledge of the structure of the seeds is of such importance for a correct discrimination of species as *Delphinium*, including *Aconitum*. Fortunately the collections of Indian plants made since the publication of the first volume of the *Flora of British India* have furnished the writer with sufficient material to settle several doubtful points and to assign to certain forms their right place by making use of characters derived from the seeds. Thus it has been found that *D. ranunculifolium* of Wallich is not a variety of *D. elatum*, but belongs to the group of *D. speciosum*; that *D. Jacquemontianum* cannot be referred to *D. Brunonianum*, but has either to be considered a subspecies of *D. kashmirianum*, or taken as an independent species; that the Khasian forms of *D. altissimum* must be separated from the Himalayan forms and raised to the rank of a species, to which the name of *D. stapeliosmum* has been given by the writer.

But although a detailed and rather laborious investigation has led the author to the conclusion that it is always unsafe to separate or to unite two otherwise closely allied forms unless their seeds be known, too much importance should not be attributed to differences in minute details of their structure. To cite two examples:—*D. divaricatum*, Ledeb., is stated in Boissier's *Flora Orientalis* to have seeds with narrow continuous wrinkles, whilst Hohenacker's specimens from Georgia have seeds with deeply notched, nearly separate scales. *D. rugulosum*, Boiss., is distinguished from *D. persicum*, Boiss., by the seeds of the former having "distinct adpressed scales," whilst the seed-scales of the latter are "abbreviated and united into transverse wrinkles." As a matter of fact the case is sometimes reversed, as an inspection of figs. 11—14 on plate 119 will show, where 11 and 14 are from specimens of the true *D. persicum*, whilst 12 and 13 are from plants which otherwise are good examples of *D. rugulosum*. Drawings of the seeds of practically all the *Delphinia* from the region which is here considered are found on plates 119, 121 and 127. The only Indian species of which the seeds are yet unknown is *D. pachycentrum*, with is more western subspecies *tsangense*; and this belongs very probably to the pterospermous larkspurs. Of no less importance than in *Delphinium* are the seeds in *Aconitum*, a point overlooked by Regel in his excellent enumeration and definition of Russian aconites contained in "Reisen in dem Süden von Ost-sibirien." The seeds of the various species of *Aconitum* are sufficiently well known to utilise them in working out a classification, of which the following is an attempt:—

Section I.—LYCOCTONOIDEÆ. Posterior sepal with a cylindrical, club-shaped, conical or spur-like, protuberance; seeds transversely rugose; flowers yellow, purplish, or red.

Section II.—CAMMAROIDEÆ. Posterior sepal more or less vaulted, sometimes thick-cylindric and incurved; seeds lamellato-rugose; flowers blue or variegated, rarely dark-red, purplish-brown, yellowish or white.

Section III.—NAPELLOIDEÆ. Posteriors epal more or less vaulted, seeds three-sided, pyramidal, more or less winged along the edges, otherwise smooth; flowers usually blue, or variegated, rarely yellow.

EXAMPLES.—I. Lycoctonoideæ: *A. Lycoctonum* with its innumerable varieties.

II. Cammaroideæ: *A. variegatum*, Linn.; *A. paniculatum*, Lam.; *A. Fischeri*, Rchb.; *A. volubile*, Pall.; *A. uncinatum*, Linn.; *A. ferox*, Wall.; *A. luridum*, H. f. et T.; *A. gymnandrum*, Maxim.

III. Napelloideæ: subsection 1.—Napelleæ: sepals deciduous, blue or variegated with white: A. *Napellus*, Linn.

Subsection 2.—Anthoreæ: sepals marcescent, yellow: *A. Anthora*, Linn.

For convenience of reference we append a list of the species of which seeds are figured on the accompanying plates:—

PLATE 116, *fig.* 13. *D. uncinatum pseudovestitum.*
PLATE 117, *fig.* 10 (a), (b), (c) *D. saniculifolium refractum;* (d) *D. denudatum.*
PLATE 118, *fig.* 10. *D. grandiflorum,* (a) var. *paradoxa,* (b) var. *Linnaei,* (c) var. *bhotanica.*
PLATE 119, *fig.* 11. *D. persicum,* Shiraz.
12. *D. rugulosum,* Mount Shebo, Beluchistan.
13. *D. rugulosum,* Hari rud.
14. *D. persicum,* var. *arianense* P.B., Shebo.
15. *D persicum,* var. *Stocksianum,* Beluchistan.
16. *D. persicum,* var. *afghanium,* Afghanistan.
17. *D incanum,* Kashmir.
18. The same.
19. *D. denudatum,* N. W. Him.
20. *D. saniculifolium,* var. *kohatensis,* Kohat.
21. *D. uncinatum,* Hazara.
22. *D. speciosum* Bieb. subsp. *ranunculifolium,* var. *oinophyllum,* Kashmir.
23. *D cashmirianum,* Lahul.
24. *D. Jacquemontianum,* (a) Bashahr, (b) Dhauli valley, Kumaun.
25. *D. Brunonianum,* Kashmir.
26. *D. densiflorum,* Bashahr.
27. *D. viscosum,* Sikkim.
28. *D. vestitum,* N.-W. Him.
29. *D. stapeliosmum,* Khasia.
30. *D. incisum,* Nipal.
31. *D. glaciale,* Sikkim.
32. *D. grandiflorum,* war. *bhotanica,* S. E. Tibet.
33. *D. dictyocarpum* (unripe).
34. *D. dasycaulon,* W. Ghats.
PLATE 121, *fig.* 10. *D. stapeliosmum,* Khasia.
11. *D altissimum,* E. Nepal.
12. *D. cheilanthum schizophyllum,* Kumaon.
PLATE 122, *fig.* 20. *D. densiflorum,* Lebung pass.
PLATE 123, *fig.* 11. *D. viscosum,* Sikkim.
PLATE 127, *fig.* 10. *D. speciosum,* subspecies *ranunculifolium,* (a) var. *thyrsantha*; (b) var. *eriantha*; (c) var. *oinophylla.*

We proceed now to the consideration of those species which are figured on plates 116—125, 127, 126.

DELPHINIUM UNCINATUM, *H. f. et T.*

A perennial herb. Rhizome descending or vertical, subcylindric, 4—8 mm. thick, covered with old leaf-sheaths at the apex. Stem solitary or double, simple or scarcely branched, terete, subflexuose to geniculate, 12—45 cm. high, near the base 2—4 mm. thick, internodes very short near the base, upwards 1—4 cm. long, entirely glabrous or from a glabrescent base upwards densely velvety with spreading hairs of a length of 1—2 mm. Leaves long-petioled, crowded at the base; petioles slender, subcanuliculate, dilated at the base into a lanceolate parallel-veined sheath, two to three times as long as the lamina, glabrous or somewhat hairy; leaf-blade trisect to the base, 1·5 to 6 cm. long, 2·5 to 8 cm. broad, glabrous or villose especially when young; segments cuneate at the base, lateral ones unequally bisect with the external divisions often deeply bipartite, divisions lanceolate in outline, divergent, alternately or suboppositely pinnately incised,

laciniæ linear, often ensiform rarely abbreviated, entire or again incised, ultimate lacinulæ callose-apiculate; lower cauline leaves shorter petioled, petioles 2—4 cm. long and sheathing for a shorter distance, blade 3—5-sect, segments linear, entire or sparsely pinnately incised, middle one 1·5 – 4 cm. long, 1—2 mm. broad. Inflorescence racemose or racemose-paniculate, 10—25 cm. long, lax. Pedicels terete, spreading, straight or scarcely arcuate, 4—6 mm. long, somewhat thickened upwards. Bracts at the base of the pedicels, linear or sublanceolate, acute, like the bracteoles glabrous or hirsute, 4 –7 mm. long. Bracteoles linear, basal, lanceolate-linear, about 2 mm. long. Torus depressed, glabrous or hirsute. Sepals bluish, spreading, all glabrous, or the posterior and anterior ones woolly, the lateral ones hairy along the middle on the outer surface; lamina of posterior sepal elliptic, obtuse, 7—12 mm. long, spur saccate or subcapitate at the apex, straight or moderately incurved, horizontal or somewhat ascendent, longer or slightly shorter than the pedicel, 7—10 mm. long, near the apex 1·5—2 mm. thick; lateral sepals oblong-obovate, rounded, entire or subcrenate; anterior ones elliptic-oblong, obtuse, 8—12 mm. long. Lamina of nectariferous staminodes with sigmatoid anterior margin, at the tip shortly bilobed, glabrous or slightly ciliate, 7—10 mm. long; spur open on the inner side to $\frac{1}{3}$ or $\frac{1}{2}$, glabrous or inside minutely hairy, below the open part more or less constricted, capitate at the nearly straight or hooked tip. Anterior staminodes petaloid, lamina oblong, bilobed to about the middle, 6—8 mm. long, villose or shortly hairy on the upper surface, dorsally glabrous or villose, lobes broad-linear, rounded or obtuse at the apex; claw linear, papillose, 4—6 mm. long, shorter than the lamina or equal to it. Stamens about 25, subequal; filaments dilated below, linear, about 5 mm. long, glabrous or sparsely ciliate, nearly filiform near the tip; anthers orbicular. Pistils 3, erect; ovaries oblong; glabrous or hairy, 2·5—3 mm. long; styles nearly straight, stigmatose at the apex, 1—1·5 mm. long, glabrous.

Flowers in June and July.

Var. α. PSEUDOVESTITA *P. B.*; stem, pedicels, sepals velvety with spreading hairs, laciniæ of leaves elongate. Beluchistan (*Stocks.*); Panjab, near Hassan Abdal (*Aitchison!*), and in other localities.

Var. β. AITCHISONI, *Boiss.*; stem, pedicels, sepals velvety; laciniæ of basal leaves more or less abbreviated. Kurrum Valley, near Alikhel (*Aitch.!*).

Var. γ. VICARYI *P. B.*; quite glabrous; laciniæ of basal leaves elongate. Panjab, near Rawal Pindi (*Vicary*); near Hassan Abdal (*Aitchison!*); Afghanistan (*Griffith!*).

PLATE 116. *Delphinium uncinatum*, H. fil. and Th. 1. var. *Vicaryi*; 2, inflorescence of var. *pseudovestita*; 3, young plant of var. *Aitchisoni*; 4, basal leaf of var. *α*; floral details; 5—7 of var. *α*; 8, of var. *γ*; 9, of var. *β*; 10, pedicels: (*a*) and (*d*) *pseudovestita*, (*b*) *Aitchisoni*, (*c*) *Vicaryi*, (*e*) *D. quercetorum*, (*f*) *D. Cyphoplectrum stenophyllum*, (*g*) *D. Cyphoplectrum microphyllum*; 11, nectariferous staminodes of (*a*) *D. Cyphoplectrum stenophyllum*, (*b*) *D. Cyphoplectrum typicum*, (*c*) *D. quercetorum*; 13, seed of *D. uncinatum*, var. *α*.

DELPHINIUM SANICULÆFOLIUM, *Boiss.*

Rhizome thick, fusiform, subtuberous or irregularly stout cylindric; stem erect, flexuose, branched or simple; petioles sheathing; basal leaves subisodiametric, 2·5—4 cm. long, trisect or deeply tripartite with the lateral segments less deeply bipartite, divisions cuneate pinnately cleft and incised, cauline leaves more distinctly tripartite; inflorescence racemose, simple or compound, racemes lax or rather dense; bracteoles

inserted near the base of the pedicel; flowers blue; lateral sepals 8—10 mm. long; sepaline spur cylindric or slender conical, symmetric or gibbous, 7—13 (-20) mm. long; anterior nectaries light-coloured, nearly as long as the lateral sepals, bifid, rarely shortly bilobed; pistils 3; follicles cylindric, 8—10 mm. long; seeds broadly obpyramidate rounded, wrinkled with scariose closely imbricate scales.

Flowers in June and July.

Distribution: Persia, Afghanistan, Punjab.

An examination of the numerous specimens of *D. saniculæfolium* in the herbaria of Calcutta and Saharanpur shows of how little importance variations in the form of the spurs of the posterior sepal and of the nectaries are in the group of forms of which *D. hybridum* may be taken as the type. This holds good especially with regard to the gibbosity of the sepaline spur, which is due to an excess of growth of the nectarial spurs which get curved and force part of the sepaline spur outwards. Accordingly we find gibbous spurs in *D. hybridum* and *D. denudatum* and straight or regularly curved spurs in *D. cyphoplectrum* and *D. saniculæfolium*. As the other characters on which Boissier bases the distinction between *D. cyphoplectrum* and *D. hybridum* prove variable, the former has to be reduced to the rank of a subspecies of the latter. To return to *D. saniculæfolium*. The plant collected by Aitchison in the Kurrum Valley, and which Boissier refers as variety *macroplectrum* to *D. penicillatum*, is much more closely allied to the Gilgit forms of *D. saniculæfolium*; and as the name *macroplectrum* ceases to be appropriate, the writer prefers to call it var. *kurrumense*. To the group of *D. saniculæfolium* belong also some plants from Eastern Afghanistan, among them No. 45 of Herb. East Ind. Comp., *D. tuberosum?* They are characterized by their long narrow-cylindrical sepaline, and elongated awl-shaped nectarial spurs. The insufficiency of the material leaves it somewhat doubtful whether this should be united with *D. saniculæfolium*, or considered a separate species To a certain extent it reminds one of some forms of *D. denudatum*, but the seeds are those of *D. saniculæfolium*. It is here described as subspecies *centeteroides*.

The following varieties may be distinguished :—

Subspecies I. VERUM.

Var. a. REFRACTA; branched, glabrous or sparsely hairy; sepaline spur cylindric, gibbous, longer than the lamina; nectarial spurs refracted at the apex; ovaries glabrous.—Southern Persia, Afghanistan.

Var. β. AQUILEGIFOLIA, Boiss.; branched, without glands, glabrous or sparsely hairy; spur attenuated towards the tip.—Northern Persia.

Var. γ. KOHATENSIS, *P. B.*; branched, eglandulose; branches, pedicels, and sepals minutely pubescent with crisp grey hairs; sepaline spur cylindric or conical, slender, straight or recurved, rarely obscurely gibbous at the tip; nectarial spur subulate, straight or recurved; ovaries somewhat hairy near the apex. Afghanistan (*Griffith!*); on dry hills in Kohat and Waziristan (*Drummond, herb. Calc.!*); on dry hills between the Indus and Jhelum (*Fleming*).

Var. δ. GILGITENSIS, *P. B.*; rhizome cylindric or subtuberous; stem simple or somewhat branched, pubescent with crisp hairs; sepaline spur slender, conical, straight or slightly incurved, rarely gibbous; nectarial spurs gibbous below the apex; ovaries covered all over with minute hairs. Gilgit (*Giles!*).

Var. ε. KURRAMENSIS (*D. penicillatum*, var. *macroplectrum*, Boiss.); rhizome subcylindric or tuberous; stem scarcely branched, pubescent with crisp hairs, towards the apex and the pedicels more or less glandulose; sepaline spur straight or slightly curved, slender conical, 10-12 mm. long; nectarial spurs subulate incurved; ovaries sparsely hairy all over. Kurrum Valley (*Aitchison!*); Ziarat (*herb. Sah.!*).

Subspecies II. CENTETEROIDES, P. B.; rhizome subtuberous, stem rather elongate, towards the base glabrescent, upwards sparsely hairy and like the pedicels glandulose; sepaline

spur subulate or slender, cylindrical, more or less curved, 15—20 mm. long; nectarial spurs thin, awl-shaped, slightly incurved or recurved; ovaries hairy all over; lamina of anterior staminodes suborbicular, shortly bilobed, disc and base sparsely beset with short hairs, glabrous below; seed-scales rather short, adpressed; leaves of *D. saniculæfolium*. (*Griffith*, Afghanistan, 156 *suppl. list*; *No.* 45, *Herb. East Ind. Comp.*).

D. denudatum, Wall., is very closely allied to *D. saniculifolium*; not only are its sepaline spurs very often gibbous, but even the glandular hairs which are often present on the floral axis of forms of *D. saniculifolium*, sometimes make their appearance in a similar position in specimens of *D. denudatum*. The latter can, however, be always distinguished from the former by the seed-scales being laxly, not closely, imbricate. Some specimens of *D. denudatum* agree nearly exactly with Don's *D. pauciflorum*, which has, according to Don's description, nectarial staminodes like those of *D. denudatum*, and not like those of *D. Ajacis*. The fact that Hamilton suggested *D. consolida* on his sheet has little weight, as various other guesses of his were equally wide of their mark. There would, however, be little use in changing the name of *D. denudatum* after it has obtained the sanction of long usage, the more so as the name of *D. pauciflorum* has been applied by other authors to other species, and is therefore somewhat discredited.

PLATE 117. *Delphinium saniculæfolium*, Boiss. 1, var. *kohatensis*; 2, var. *gilgitensis*; 3, var. *kurrumsis*; 4, pedicels bracteoles, and posterior sepals of a., b. var. α from Persia, c. d. var. δ from Gilgit, e. var. γ from Kohat, f. var. γ from E. Afghanistan, g, subspecies II. from E. Afghanistan; 5, nectariferous staminodes of a. b. var. α, c. d. var. δ, e. f. var. γ, g. var. ϵ, h. subspecies II. 6, petaloid staminodes of a. var. α, b. var. γ, c. var. δ, d. var. ϵ, e. subspecies II; 7, stamens of a. var. γ, b. var. ϵ, c. var. α; 8, pistils of a. var. α, b. var. ϵ. Subspecies II, d. var. γ; 9, follicle; 10, seeds of a. var. α, b. the same, apical aspect, c. subsp. II, d. of *D. denudatum*.

DELPHINIUM INCANUM, *Royle*.

Rhizome woody, cylindric or subtuberous, descending. Stem erect, branched, terete or more or less angular, in flower 50—120 cm. high, 4—8 mm. thick near base, either wholly canescent with crisp usually downwards directed hairs or glabrescent downwards or rarely upwards densely pubescent with yellow glandular hairs. Branches elongate, spreading or erect-patulous, 10—30 cm. long. Leaves on the lower surface canescent, more rarely puberulous, on the upper surface puberulous or pubescent; lower leaves shortly or long-petioled, upper ones subsessile; the longer petioles moderately dilated at the base, sometimes 5 cm. long; shorter petioles scarcely dilated, strongly striated with parallel nerves; lamina of lower leaves trisect to the base, lateral segments asymmetrically bisect, segments repeatedly pinnatisect, ultimate divisions lanceolate-linear, acute, apiculate, 2—4 mm. broad, nerves prominent beneath; upper cauline leaves smaller than the lower ones, somewhat less divided, lacinulae more acute. Flowers conspicuous, arranged in rather dense racemes. Pedicels at the base with a linear-lanceolate acute bracts of a length of 3—7 mm., 5—15 mm. long in flower, in fruit sometimes 25 mm., shorter than the spur, at or near the base, rarely above the middle, with 2 usually opposite linear bracteoles of the same length as the bract or shorter. Sepals bright blue or purplish, spreading, elliptic or the anterior ones subobovate, 10—18 mm. long, 7—11 mm. broad; anterior and posterior ones very shortly acuminate, outside densely and minutely grey-pubescent, lateral ones rather obtuse and broader, pubescent along the middle; spur about as long as the lamina or $\frac{3}{2}$ as long, horizontal or ascending, subcylindric, more rarely subulate, straight or somewhat curved, at the tip obtuse or subacute or abruptly narrowed, often narrower in the middle. Nectariferous staminodes shorter than the sepals, glabrous, anterior margin upwards bent back at nearly

a right angle, bilobed or subentire at the apex; spur straight or curved, subuate. Petaloid staminodes nearly as long as the sepals, sometimes 3 mm. shorter; lamina asymmetrically ovate, bifid to about the middle, on the upper surface near the base bearded with white hairs, often subciliate, glabrous or little hairy on the back; claw linear, a little shorter than the lamina, papillose at the edges. Stamens 40—50, about half as long as the sepals, exterior ones a little longer; filaments moderately dilated near the base, glabrous; anthers subrotund. Pistils 3, erect, 3—4 mm. long; ovaries ovate-oblong, densely and minutely pubescent; style filiform, nearly half as long as the ovary, glabrous upwards, stigma shortly bilobed. Follicles 3, on erect or patulous pedicels, chartaceous, ovoid-cylindric, reticulate, 10—12 mm. long, beset with stiffish straight or more commonly with crisp minute hairs, persistent style $\frac{1}{3}$—$\frac{1}{2}$ the length of the follicle. Seeds numerous, obpyramidate, 3—4-sided, dorsal side broader and slightly curved, covered with scariose free or slightly connate subadpressed scales, about 1·5 mm. long.

Flowers from June to September.

Kashmir (*Herb. Falc.!*); Sind valley (*Stoliczka! Clarke!*); Kishenganga valley near Gurais (*Duthie!*); Liddar valley 8—9,000′ (*Duthie!*); Pangi (*Stoliczka!*); Kunāwar (*Royle!*); Bashahr (*Lace!*).

Delphinium incanum is the Himalayan development of the polymorphous *D. hybridum*; especially close is the affinity between a rather small-flowered form from Kunāwar with purplish-blue sepals and petaloid staminodes as long as, or longer than the lateral sepals, and the laxer racemose variety of *D. puniceum* from the Caucasus. The middle cauline leaves of *D. incanum* are, however, always subsessile, the sheaths of the petioles much less conspicuous, the sepals are broad-elliptic instead of elliptic-oblong and usually larger, and the petaloid staminodes are commonly distinctly shorter (1—3 mm.) than the lateral sepals.

PLATE 119. *Delphinium incanum*, Royle. 1, upper part of flowering plant; 2, basal leaf; 3, posterior sepals, (*a*) Kashmir, (*b*) Kunawar; 4, lateral sepal; 5, anterior sepal; 6, nectariferous staminode; 7, petaloid staminode; 8, stamen; 9, (*a*) pedicel with carpels, (*b*) pistil, (*c*) hair; 10, mature carpel. Hairs similar to 9 (*c*) occur on the floral axis of *D. hybridum*, *D. cyphoplectrum*, *D. dasycaulon*, *D. grandiflorum*, *D. speciosum*, and others.

DELPHINIUM GRANDIFLORUM, *Linn.*

(*Delphinium grandiflorum*, Linn.; *D. cæruleum*, Jacquem; *D. longipes*, Franchet = *D. Davidi*, Franchet; *D. Kumaonense*, E. Huth).

Perennial; rhizome subcylindric; flowering stem 7—60 cm. high; leaves trisect or deeply tripartite, lateral segments 2 to 3-partite, divisions variously cleft and incised, lacinulae linear or linear-lanceolate or oblong, more rarely obovate or obovate-oblong; inflorescence rarely one-flowered, usually several- to many-flowered, paniculate or paniculate-corymbose; bracteoles usually above the middle of the puberulous or villose pedicles; sepals spreading, 12—15 mm. long, blue, more rarely purple, white, or greenish; sepaline spur slender conical; staminodes shorter than the sepals; lamina of anterior staminodes blue or purple, orbicular, obovate or obovate-oblong, subentire, emarginate, to bilobed beyond the middle; pistils 3—9; follicles 12—18 mm. long; seeds obpyramidal or oblong, 3—4-sided, testa more or less loose, folded into wings along the edges and more or less puckered on the sides.

Flowers about July and August.

Distribution: Siberia, China, Himalaya.

Delphinium grandiflorum, (incl. *D. cæruleum*,) is represented by numerous specimens in the herbaria of Calcutta and Saharanpur, not only from Kumaon, Sikkim, and Chumbi, but also from Siberia and

various parts of China. It has consequently been possible to trace in detail the gradual transitions between the many varieties which, however much the extreme forms may differ from each other, constitute one uninterrupted series. The most important links are formed by varieties from Mongolia and South-Eastern Tibet, the invasion of the Himalaya by *D. grandiflorum* having evidently taken place from the side of Central and Eastern Tibet. None of the characters by which *D. cœruleum* has been supposed to be distinguished from *D. grandiflorum* proves constant on detailed examination, as will be seen from the description of the varieties of *D. grandiflorum* to which we now proceed.

Var. α. LATISECTA, *Maxim.*; stem erect, middle-sized or elongate (15—80 cm.), much branched; laciniæ of leaves ovate or oftener lanceolate, acute or obtuse; sepals minutely pubescent, azure; follicles 3, recurved nearly from the middle.—Sechuan, Kansu.

Var. β. CHINENSIS, *Fischer*; tall, erect, rather rigid; laciniæ broad-linear; bracteoles minute linear, somewhat remote from flower; sepals minutely pubescent outside; lamina of anterior staminodes suborbicular, entire, glabrous on back and edges; carpels 3.—Siberia, China.

Var. γ. PUBIFLORA, *Turcz.*; stem prostrate, like peduncles and sepals densely minutely pubescent; laciniæ elongate, narrow-linear; anterior staminodes suborbicular, entire.—Baical region.

Var. δ. LINNÆI; stem tall, erect, like peduncles and sepals minutely crisp-pubescent; laciniæ narrow-linear, elongate; bracteoles linear, small, more or less remote from flower; lamina of anterior staminodes suborbicular, entire or emarginate, glabrous below, sometimes ciliate; carpels 3 (—4); follicles straight or recurved at the apex.—Siberia, Mongolia, Northern and Central China proper, Yarkand.

Var. ε. POTANINI, *P. B.*; as in δ, but lamina of anterior staminodes obovate-oblong, emarginate or bilobed, ciliate, more or less hairy below; sepals outside near the base minutely pubescent or sub-villose.—Setchwan (*Potanin!*).

Var. ζ. KUMAONENSIS, *E. Huth*; stem erect, subglabrous, 40—60 cm. high, 3—4 mm. thick near base; leaves 3-partite, middle division 3-fid, lateral ones divided into 3 or more segments, laciniæ broad-linear, the longer ones sometimes 2 cm. long by 2 mm. broad; inflorescence racemose-paniculate, many-flowered; pedicels villous; bracteoles small, linear remote from flower; sepals 11—18 mm. long, sky-blue, villous outside; lamina of anterior staminodes suborbicular, subentire or deeply bilobed, yellow-bearded, blue; carpels 3.—Kumaon: Byāus, near Kutti 13—14,000′ (*Duthie!*); Dārma, in the Nipchang valley 13—14,000′ (*Duthie!*); on Mulapa Gādh 11—12,000′ feet (*Duthie!*); Nipal; on Nampa Gādh, 10—11,000′ (*Duthie!*).

Var. η. TENUICAULIS, *P. B.*; stem very slender (30—50 cm. high, 1—1·5 mm. thick), sparsely beset with retrorse hairs; leaves remote, moderately cut, laciniæ lanceolate-linear, subobtuse, the longer ones 15—35 mm. long, 2—3 mm. broad; inflorescence racemose, very lax, few-flowered; bracteoles linear, remote from the flowers; peduncles and sepals covered with short hairs; sepals blue or purple; lamina of anterior staminodes obovate-oblong, bilobed or nearly bifid, hirsute on upper surface, rarely nearly bearded; carpels 3.—Chumbi: near Phēmū and Rinchingong (*King's collectors!*).

Var. θ. DAVIDI, *Franchet pro sp.*; middle-sized, hispidulous with longish adpressed or spreading hairs; stems slender, ascending; laciniæ of upper leaves linear; flowers solitary or subcorymbose; peduncles shortly retrorse-pubescent; sepals puberulous; anterior staminodes oblong, bilobed, near the base yellow-bearded; carpels 3 (?).—Tibet, prov. Mūpin.

Var. ι. SETCHWANENSIS, *P. B.*; a small slender plant, scarcely branched; stem and peduncles retrorse-pilose, indumentum below the sparsely hairy sepals rather longer; laciniæ linear-lanceolate; bracteoles elliptic-oblong, opposite, just below the sepals; lamina of anterior staminodes ovate-oblong, deeply bilobed, slightly hairy; carpels 3.—Setchwan (*Henry!*). This variety, like δ, μ, ζ and others, might be considered a species of the second order.

Var. κ. KUNAWARENSIS (= *D. cœruleum* of Jacquemont); stem 30—50 cm. high, 3—5 mm. thick; leaves little or not crowded near the base, much divided; laciniæ linear, acute or subacute, 5—20 mm. long, 1—2 mm. broad; inflorescence paniculate-corymbose,

many-flowered; bracteoles alternate, small, linear, remote from flower; sepals villous near the base, azure, 12—15 mm. long, lamina of anterior staminodes suborbicular, entire or emarginate, yellow-bearded; carpels 5.—N.-W. Himalaya.

Var. λ. BHOTANICA, *P. B.*; stem 15—50 cm. high, 1·5—5 mm. thick near base; laciniæ linear, acute, or subacute, 5—20 mm. long, 1—2 mm. broad; inflorescence ample, paniculate-subcorymbose, many-flowered; bracteoles alternate, small, linear, remote from flower; sepals villous near the base, 16—25 mm. long, blue or purple; lamina of anterior staminodes suborbicular or rounded-subquadrate, more rarely obovate-oblong, entire, emarginate, or shortly bilobed, yellow-bearded; carpels 5.—Bhūtān, near Ta-lū-ny; Chumbi and Phāri (*King's collectors!*).

Var. μ. PARADOXA, *P. B.*; flowering plant 15—20 cm. high; leaves more or less crowded near the base, trisect, segments variously cleft, laciniæ abbreviated lanceolate, lacinulæ oblong or cuneate-obovate 1·5—8 mm. long, 1—2 mm. broad, usually rather obtuse; flowers 1—3; peduncles 8—12 cm. long, ebracteate or bibracteate, bracts oblong-lanceolate entire or conform to the leaves; sepals subhirsute, outside yellowish green, inside white; lamina of anterior staminodes subelliptic, shortly bilobed, yellow-bearded; carpels 3; seeds blackish, narrow-winged.—Chumbi; Tah Tsong (*King's collectors!*).

Var. ν. OBTUSILOBA, *P. B.*; flowering plant usually 6—15, rarely 30 cm. high; stem branched from the very base; leaves rather crowded near base, much cut, densely pubescent; lacinulæ linear-oblong or oblong-obovate, very rarely linear, obtuse, rarely subacute; inflorescence subcorymbose, two to many-flowered, rarely flowers solitary; bracteoles remote from flower, lanceolate or oblanceolate or sublinear; sepals densely villous near base, with yellow hairs, inside sky-blue or purple; lamina of anterior staminodes suborbicular, entire or emarginate, yellow-bearded; carpels 5.—Chumbi and Phāri: near Gūp, Ting, Phāri, Giagong, Cha-Rung-la (*King's collectors!*).

Var. ζ. TSANGENSIS, *P. B.*; small, branched herb; stem, peduncles, and azure sepals minutely and sparsely pubescent; leaves subglabrous; laciniæ of basal leaves abbreviated, of upper leaves linear; flowering branches slender; bracts 2, alternate, linear, more or less remote from flower, lower one often 1—2 cm. long; lamina of anterior staminodes suborbicular, crenulate, yellow-bearded; carpels 5.—Tibet, between northern frontier of Sikkim and Lhassa (*King's collectors!*).

PLATE 118. *Delphinium grandiflorum*, Linn. 1, var. η *tenuicaulis*; 2, var. ν *obtusiloba*; 3, var. ο, *tsangensis*; 4, posterior and lateral sepal of var. *Kumaonensis*, Kumaon; 5, the same of var. *pubiflora* Turcz., Baikal region; 6, petaloid staminodes (lateral petals): a. var. *Linnaei*, Yarkand; b. var. *obtusiloba* Chumbi; c. var. *Linnaei*, Siberia, d. var *bhotanica*, Phari; e. var. *Kumaonensis*, West Nipal; f. var. *Potanini*, Setshwan; g. the same; h. var. *setshwanesis*, Setsshwan; i. var. *tsangensis*, S.-E. Tibet; k. var. *tenuicaules*, Sikkim; l. var. *paradoxa*; 7 stamens; a. var. *paradoxa*; b. var. *setwshanensis*, c. var. *tsangensis*; d. var. *Potanini*; 8, gynoecium; a. var. *Kumaonensis*; b. var. *bhotanica*; c var. *paradoxa*; d. var. *tsangensis*; 9, stigma of var. *tsangensis*; 10 seeds; a. var. *paradoxa*; b. var. *Linnaei* c. var. *bhotanica*; 11 upper part of pedical; a. var. *bhotanica*; b. var. *Kumaonensis*; c. var. *Potanini*; d. var. *typica*; e. var. *tsangensis*.

DELPHINIUM CHEILANTHUM, *Linn.*, *subsp.* SCHIZOPHYLLUM, *P. B.*

This plant was gathered by Col. Davidson on the China hill near Naini Tal. It is here referred to in order to draw the attention of Indian botanists to this interesting form, which establishes another link between the flora of the Western Himalaya and that of Siberia. It is marked *D. elatum* on the label, and probably has not been specially noticed before, because field botanists have mistaken it for a form of that species. The petaloid staminodes are, however, blue, and their lamina is suborbicular and emarginate, exactly as in *D. glandiflorum* and *D. cheilanthum*. From all the varieties of the former it differs by the shape and the mode of division of its leaves, in which respects it agrees much more closely with *D. cheilanthum*. Whether it may ultimately prove

a species of the first order further observation must show. We consider it at present a subspecies of *D. cheilanthum*, with which we unite also Trautvetter's *D. Middendorffii.* We have thus—

Subspecies I. CHEILANTHUM VERUM; stem glabrous; inferior leaves trisect, lateral segments again 2- or even 4-sect or partite; segments divergent, rhombic or rhombeo-oblong in outline, trifid, laciniæ incised; upper ones 3- to 5-sect, segments subentire; petaloid staminodes suborbicular, quite entire or shortly bilobed; follicles reticulate.—Siberia.

Subspecies II. MIDDENDORFFII, *Trautv.*; stem glabrous; leaves finely pubescent or glabrous beneath; basal ones deeply tripartite, lateral segments again bipartite; all segments divergent, obovate-cuneate, tri- or bifid; segments of cauline leaves rhombeo-lanceolate in outline, deeply cleft, laciniæ linear; petioles shortly sheathing; pedicels patulous; lamina of petaloid staminodes obovate; sepals elliptic-oblong.—Siberia, Northern Mongolia.

Subspecies III. SCHIZOPHYLLUM, *P. B.*; tall, erect, glabrescent; leaves sparsely pubescent, dark-green above, pale beneath; lower cauline leaves deeply tripartite, lateral segments very broad, about 4-partite; partitions and middle segment overlapping, rhombic, laciniæ broadly linear or lanceolate, deeply incised and sparsely serrate, lacinulæ lanceolate to lanceolate-linear; upper cauline leaves less frequently divided, the ultimate segments very long and linear, acute; inflorescence racemose compound below, lax; bracts trisect below, lanceolate upwards; pedicels erect, recurved and pubescent at the tip, elongating after flowering, lower ones 5—6 cm. long; bracteoles lanceolate-subulate, a little below the flower; sepals bright blue, broadly elliptic, about 18 mm. long, lateral ones about 15 mm. broad; spur longer than lamina; staminodes shorter than the sepals; lamina of petaloid staminode suborbicular, emarginate, yellow-bearded near the base; pistils 3; ovaries hairy; follicles cylindric, about 22 mm. long; seeds rounded obpyramidal, large; testa much puckered, more or less folded up along the edges.—Kumaon.

PLATE 121, *fig.* 19. Seed of *Delphinium cheilanthum*, Linn., subsp. *schizophyllum.*

DELPHINIUM DICTYOCARPUM, *DC.*

Perennial; stem tall, 3—5 mm. thick near base; leaves subcoriaceous, deeply tripartite, with the lateral segments 2—3-partite; inner divisions lanceolate or acutely deltoid in outline, all of them pinnately cleft and incised, lacinulæ broad- or narrow-lanceolate; petioles somewhat dilated at the base; inflorescence racemose-paniculate or racemose, very lax or rather dense; sepals blue; anterior staminodes shorter than the sepals, blue, rarely pale purple; lamina ovate shortly bilobed or subbifid, yellow-bearded about the middle; carpels 3; seeds obpyramidate, narrow-winged along the edges.

Distribution.—Altai; Setchwan; Tsang.

Subspecies I. LAXIFLORUM, *DC. pro sp.*; sepals 20—25 mm. long; anterior staminodes $\frac{1}{2}$ to $\frac{1}{3}$ the length of the sepals, sparsely ciliate with short yellow bristles; ovaries and follicles pubescent with dense crisp hairs.—Altai; Setchwan or Eastern Tibet.

Subspecies II. DICTYOCARPUM PROPRIUM; sepals 11—15 mm. long; anterior staminodes villose-ciliate with white hairs; ovaries sparsely pilose or densely pubescent.—Altai.

Subspicies III. TIBETICUM, *P. B.*; sepals 12—18 mm. long; anterior staminodes $\frac{2}{3}$ the length of the sepals, shortly bilobed, villose-ciliate with white hairs; ovaries densely pubescent; inflorescence subdensely racemose.—Southern Tibet, between the northern frontier of Sikhim and Lhassa.

Var. α. GLANDULOSUM, *P. B.*; floral axis and pedicels glandular hairy.

Var. β. CINEREUM, *P. B.*; floral axis and pedicels densely pubescent with short soft grey hairs (*indumentum like that of the floral axis of the ordinary form of* D. incanum). This is probably the *Delphinium* referred to by Hooker and Thomson in the Flora of Br. Ind. in the words:

"Fragments of a *Delphinium* closely allied to *D. incanum* were brought by Dr. Hooker from Tibet, north of Sikkim; it differs from *incanum* in the slightly notched petals, and may be new."

PLATE 119, *fig.* 33. Seed of *Delphinium dictyocarpum*, DC.

DELPHINIUM ALTISSIMUM, *Wall.*

The great resemblance which the vegetative parts of the Khasian larkspurs bear to those of Wallich's *D. altissimum* has induced botanists to refer them to the latter species. It is true that the inflorescence of the Khasian plant is much opener, that the colour of the staminodes is dark-blue instead of light-purple, and that Wallich omits to make any remark about the odour of the flowers, which in the Khasian plants are fetid like those of a *Stapelia*; but these characters may be considered of minor importance and not sufficient to separate two form-groups as species. Recently, however, Dr. King's collectors have gathered fruiting specimens near the Nipal frontier, and we know now that the seeds of *D. altissimum* are very different from those of the Khasian *Delphinium*. The latter has the seeds of *D. grandiflorum* and *D. elatum*, where the lightbrown epidermis is thrown into wing-like folds along the edges of the obpyramidate seed and becomes more or less puckered on the dorsal and ventral surfaces (see plate 121, figures 10, *a*, *b*, *c*); on the other hand, the seed of *D. altissimum* is obovoid, has a brownish-black testa, and although obscurely wrinkled it is neither winged nor scaly, and therefore constitutes, as far as larkspurs go, a distinct type of seed (see plate 121, fig. 11 *a*, *b*). The cells of the epidermis are much larger in the Khasian plant (plate 121, fig. 10 *a*) than in *D. altissimum* (ibidem, fig. 11 *c*). The Khasian plant will therefore be described under the name *D. stapeliosmum.*

There is comparatively little to be added to Wallich's description of *D. altissimum* in the second volume of his *Plant. As. Rariores*: the few additions concern the seed and the remarkable form defined below as subspecies *drepanocentrum*. Regel reports *D. altissimum* from Turkestan; but, in the absence of specimens from that country, and in consequence of Regel not mentioning the colour of the staminodes or the structure of the seeds, the writer is unable to say whether the Turkestan specimens are referable to *D. altissimum*, or whether they may not be a variety of *D. ranunculifolium*, Wall., Indian specimens of which might often easily be confounded with *D. altissimum.*

The Indian forms may be grouped as follows:—

D. ALTISSIMUM, *Wall.*, a tall perennial herb; stem glabrescent below or densely hirsute from the base; lower leaves very long-petioled, blade reniform or subisodiametric, much paler below, deeply tripartite, lateral segments unequally 2—3- lobed, segments and lobes trifid, crenate-serrate; inflorescence racemose or racemose-paniculate; racemes elongate, many-flowered, lax or rather dense, spur as long as, or longer than, the sepals; sepals blue; staminodes shorter than the sepals, light-purple, blade of petaloid staminodes shortly bilobed, hairy; follicles 3, patulous, subcylindric, about 1·5 cm. long; seeds obovoid, brownish black, obscurely wrinkled, neither winged nor scaly.

Subspecies I. WALLICHII; stem upwards pubescent with fine crisped colourless hairs; upper surface of leaves rather sparsely covered with adpressed hairs, nearly glabrous beneath except the nerves; spur little longer than the sepals, nearly straight or gently recurved; ovaries ciliate on the ventral suture, otherwise glabrous or sparsely and finely pubescent.

Var. a. NIPALENSIS, *P. B.*; bracteoles remote from the flower, small, lanceolate; sepaline spur straight or slightly incurved.—Nipal (*Wall.!*). This is probably Don's *D. Carela.*

Var. β. PHALLUTENSIS, *P. B.*; bracteoles close to the flower, rather conspicuous, linear; sepaline spur often slightly recurved.—Sikkim: near Sikangam 12,000′; Subikũng, Phullut (*King's collectors!*).—Flowers in August.

Subspecies II. DREPANOCENTRUM, *P. B.*; a middle-sized herb; the whole stem covered with dirty-yellow more or less deflexed, partly glandular hairs; blade of leaves hairy above, subhirsute beneath; bracteoles close to the flower, linear; sepaline spur distinctly longer than the sepals, sickle-shaped; ovaries hirsute.—Western Sikkim, near Wallanchũn (*King's collectors!*). Flowers in August and September.

PLATE 120. *Delphinium altissimum*, Wall. 1, part of infructescence of var. *phallutensis*; 2, (on the right) nectariferous taminode of the same; 3, pistil of var. *nipalensis*; 4, the same of var. *phallutensis*; 5, ditto of subspecies *drepanocentrum*; 6—9 staminodes; 6, of var. *phallutensis*; 7—9, of *D. drepanocentrum*; 10—13, refer to *D. drepanocentrum*; 10, lateral sepal; 11, posterior sepal, 12, (2 on the left) nectariferous staminode; 13, stamen; 14, ripe follicle of var. *phallutensis*

PLATE 121, *fig*. 11. Seed of *Delphinium altiesimum* Wall.

DELPHINIUM STAPELIOSMUM, *P. Brühl.*

(*D. altissimum, H. f. et T. in the Flora of Br. India as to the Khasian specimems.*)

Stem erect (40—) 70—150 cm. high, branched, beset with stiff retrorse hairs especially upwards; leaves very pale below, reniform or suborbicular, cordate, more or less deeply tripartite, lateral segments trapezoidal unequally bilobed, all divisions very coarsely serrate; inflorescence a very lax large subracemose panicle; peduncles suberect, lower ones up to 10 cm. long; bracteoles nearly always alternate, inserted at varying heights; flowers fetid; sepals deep-blue or purple; sepaline spur subulate, 1—5 mm. longer than the lamina; anterior staminodes much shorter than the sepals, very dark-blue, ovate, bifid or subbilobed, yellow-bearded; ovaries densely hairy; follicles 3, cylindric, 13—20 mm. long; seeds obpyramidate, subtriangular in cross-section, conspicuously winged along the edges, puckered on the sides, epidermal cells very large and irregular.

Flowers in September and October.

Distribution: Khasia; Shān Hills.

From the true *D. altissimum* of Wallich the present species differs by its inflorescence, which in *D. altissimum* is much more distinctly racemose; by the bluish-black (not light-purple) anterior staminodes, its fetid flowers, and especially by its seeds (compare plate 121, figs. 10 *a*, *b*, *c*, *d* with figs. 11 *a*, *b*, *c*).

Var. a. KHASIANA, *P. B.*; leaves more or less deeply palmatipartite, coarsely serrate.—Khasia 5-6,000′ (*Herb. Calc.!*).

Var. β. SHANICA, *P. B.*; leaves 5-lobed scarcely to the middle, coarsely dentato-crenate; inflorescence an exceedingly large panicle; flowers often more distinctly racemose.—Shan Hills, 4—5,000′ (*Collett.!*).

PLATE 121. *Delphinium stapeliosmum*, P. Brühl. 1, an exceptionally small-sized flowering plant from *Khasia*; 2. extremity of axis with head of follicles, from a tall specimen, *Khasia*; 3, part of upper lateral branch of var. *shanica*, Shan Hills; 4, nectariferous staminode; 5, petaloid staminode; 6, basal portion of petaloid staminode; 7, stamen; 8, gynœcium; 9, stigmatose part of style; 10, seed of *D. stapeliosmum*: (*a*) dorsal, (*b*) ventral aspect, (*c*) cross-section through upper half, (*d*) epidermis; 11, seed of *D. altissimum*, Wall., Phullut: (*a*) dorsal aspect, (*b*) cross-section; 12, seed of *D cheilanthum*, subspecies *schizophyllum*, China Hill, Garhwal.

DELPHINIUM DENSIFLORUM, *Duthie.*

(*Plants of Kumaon No.* 2677; *D. Brunonianum*, var. *densa*, Maxim. *in Flora Tangutica.*)

A perennial, middle-sized herb. Rhizome descending, subcylindric, 3—5 mm. thick. Stem erect, strict, simple or scarcely branched, subcylindric, striated, fistulose, 30—50 cm. high, 6—10 mm. thick near the base, glabrescent below, upwards beset with white partly crisp retrorse hairs partly villose with longer spreading hairs often mixed with yellow glandular hairs. Lower leaves very long-petioled; petioles gradually dilated near the base, 5—18 cm. long, somewhat hairy; lamina reniform, at the base cordate, 3-partite to $\frac{2}{3}$, 3·5—6 cm. long, 6—10 cm. broad, beneath paler, puberulous or subvillous; middle

segment cuneate-obovate, trifid upwards, lateral segments trapezoidal, 3—4-lobed; lobules serrate-crenate, serratures callose-apiculate; upper leaves gradually decreasing in size and simpler with woolly petioles; lower floral leaves shortly petioled, subtruncate at the base or with a wide triangular sinus, palmately tripartite, divisions serrately incised and crenate-serrate; intermediate floral leaves petiolate or sessile, cuneate, 3- or 2-fid, dorsally woolly near the base, laciniæ quite entire or sparsely serrate; uppermost leaves lanceolate or lanceolate-linear, attenuated towards the base; narrowed upwards, 1·5—2·5 cm. long, sometimes glandulose. Inflorescence racemose, very dense. Peduncles erect, strict, terete or sub-angular, lanate, lower 4—5, uppermost 1·5—2 cm. long, 1—2 mm. thick, bibracteolate at the middle or near the top. Bracteoles opposite, sessile, adpressed, linear, narrowed upwards, callose-apiculate, 10—15 mm. long, 2—4 mm. wide near base, hairy on the back, ciliate. Sepals patulous, outside greyish-blue with blue nerves or entirely sky-blue, concave, short-acuminate, sublanate outside, ciliate, inside hairy along the nerves; lamina of posterior sepal 2—2·5 cm. long, broad-elliptic; spur either subsaccate, obtuse, about 6 mm. long, 3—4 mm. thick near base, or conical, subacute, 12—15 mm. long; lateral sepals suborbicular, 16—20 mm. long. Lamina of nectariferous staminodes asymmetrically spatulate, at the apex bilobed or emarginate, 12—15 mm. long, below 1·5—2 mm., near the apex 2—5 mm. broad, glabrous or on the inner side of the broader top hairy, or at the tip yellow-bearded; spur slender-conical, acute, subincurved, inside open to about one-third and here glabrous or minutely hairy. Petaloid staminodes with an ovate or obovate bifid lamina, which is 6—7 mm. long, on the upper surface rather densely hairy, near the base somewhat bearded with yellow or white hairs, ciliate, dorsally hairy; lobes divergent ovate-oblong, subacute (sometimes the lamina is bilobed and erose or unequally trifid); claw linear, at least as long as the lamina, dorsally somewhat hairy. Stamens moderately numerous, 5—9 mm. long, innermost by about 1 mm. shorter, glabrous; filaments dilated towards the base; anthers ellipsoidal, obscurely apiculate, about 0·8 mm. long. Pistils 3, erect, 4—5 mm.; ovaries ovoid-oblong, reticulate, 3 mm. long, glabrous, or glabrous dorsally, ventrally minute-pubescent, or densely pubescent all over; style filiform. Ovules about 20. Follicles 3, membranceous, erect, cylindric, obliquely subtruncate at the rounded tip, 11—12 mm. long, white-villose, style 3 mm. Seeds obpyramidal, about 2 mm. long, brown, winged with the loose testa.

Flowers in August and September.

Var. α. PLATYCENTRA, *P. B.*; spur about 6 mm. long, subsaccate, sepals greyish-blue.—Kumaon: Rālem pass 15—17,000′ (*Duthie!*), in the Lebung pass 16—17,000′ (*Duthie!*); Tangut region, near Amdo (*Maxim.*)

Var. β. STENOCENTRA, *P. B.*; spur 12—15 mm. long, conical, sepals sky-blue.—Bashahr, 14,000′ (*Watt!*).

D. densiflorum, Duthie, is very closely allied to *D. Brunonianum*, with which it has the shape of leaves and flowers, as also the seeds in common. Characteristic is its exceedingly dense inflorescence due to the pedicels being strictly erect. Mr. Duthie also tells the writer that, as far as he can remember, the flowers have not the odour of musk, in this respect therefore resembling *D. kashmirianum*. It may be pointed out here that *D. Jacquemontianum* is not reducible to *D. Brunonianum*, however great the resemblance between the two may be; for *D. Jacquemontianum* has not only dark-blue staminodes—a character perhaps not of much moment—but it has the scaly seeds of *D. kashmirianum*, whilst the true *D. Brunonianum* has the seeds of *D. elatum*. Considering that the flowers of Kashmirian specimens of *D. ranunculifolium*, which we take to be a subspecies of *D. speciosum*, are often not so very different from the more acutely spurred

flowers of some forms of *D. kashmirianum*, it is quite possible that *kashmirianum* and *Jacquemontianum* are descendants of *D. speciosum*, whilst *D. Brunonianum* may come from a common stock with *D. elatum*. If we deny specific value to glandular hairs and the absence or presence of a musky odour, we will have to regard *D. Jacquemontianum* as a subspecies of *D. kashmirianum*, but it cannot be united with *D. Brunonianum*.

PLATE 122. *Delphinium densiflorum*, Duthie; 1, var. *platycentra*; 2, bract; 3, bracteole; 4, posterior sepal; 5, lateral; 6, anterior sepal; 7—8, nectariferous staminodes; 9, 10, 11, petaloid staminodes; 12, 13, the same; 14, stamens; 15, anther; 16, gynoecium; 17, pistils; 18, ovary, opened, partly cut away; 19, ripe follicle; 20, seed.

DELPHINIUM VISCOSUM, *H. f. et T.*

An examination of the rich material collected under the direction of Dr. King proves this species to be rather polymorphous; and if it were not for the existence of intermediate forms it would be possible to split it up into two or three tolerably well-defined species. Particularly variable is the indumentum of the ovaries; but a critical study of this character leads to the conclusion that, here as everywhere, the indumentum even of the carpels is only a feeble peg to suspend a species from.

The following are the varieties of *D. viscosum* which may at present be distinguished :—

Var. α. CHRYSOTRICHA, *P. B.*; middle-sized; leaves deeply trilobate, the lateral lobes lobulate; inflorescence usually few-flowered; bracts, bracteoles, and upper surface of leaves densely clothed with soft adpressed greenish-golden hairs; bracts conspicuous, more or less like the leaves; bracteoles elliptic oblong or oblong-lanceolate, sometimes three-notched or trifid at the apex; spur subconical, scarcely or distinctly shorter than the silky sepals; ovaries silky.—Eastern Nipal: near Kanglanamo and Nirpokri 13,000′ (*King's collectors !*); Sikkim: in the Jongri district (*King's collectors !*).

Var. β. CILIATA, *P. B.*; a middle-sized or rather tall herb; leaves deeply sub-5-lobed, scarcely hairy above; inflorescence of one or a few flowers; bracts conspicuous, sepals subvillose with yellow or white hairs; spur conical or subcylindric, often quite as long as the sepals; ovaries ciliate along the ventral suture, otherwise glabrous, rarely entirely without hairs.—Sikkim, 15—16,000′ (*H. f. et T. !*), Western Sikkim (*King's collectors !*).

Var. γ. CONNECTENS, *P. B.*; a tall or middle-sized herb; leaves plurilobate, shortly hairy or glabrescent above; sepals hirsute with yellowish hairs, but not silky; spur thick-conical, straight or incurved or uberiform, about as long as the sepals; ovaries ciliate at the ventral suture, otherwise subglabrous, but follicles ciliate and subhirsute.—Sikkim: Lebu valley (*Gammie !*).

Var. δ. GIGANTOBRACTEA, *P. B.*; a tall herb; leaves multilobate, upper surface rather densely and adpressedly pubescent; inflorescence many-flowered; bracts and bracteoles often very large, lobed or entire and oblong-linear; sepals sericeo-villose with yellow hairs; spur conical, shorter than the sepals, more rarely nearly equal to them in length; ovaries wholly hirsute.—Sikkim; on the Zey-lap-la and Natu-lā; Chumbi: near Kung-bur (*King's coll. !*).

Evidently a variety of *D. viscosum* and having its place between var. *chrysotrichum* and var. *ciliatum* is Huth's *Delphinium trilobatum* (*Neue Arten der Gattung Delphinium tiré à part du Bulletin de l'Herbier Boissier, tome I, No.* 6, 1893). There is no specimen of Anderson's, exactly tallying with Dr. Huth's description, in the Calcutta Herbarium. The following is a translation of the description of the form referred to:—Stem shortly pubescent, simple, one-or few-flowered; petioles long, sheathing; leaves rounded, 3—5- partite, segments sub-cuneate crenate, incised, glabrous above, subpubescent below, bract on the pedicel multifid pubescent; bracteoles very large, close to the flower, trilobate, densely pubescent, 20 mm. long; spur straight, conical, 15 mm. long; sepals densely golden-pubescent, 30 cm. long; staminodes atro-violaceous, upper ones hairy at the apex, with a straight spur, the lower ones yellow-bearded, bifid, divisions lanceolate produced at the tip; immature follicles glabrous.—This description would apply to a

specimen of var. *chrysotrichum* with the subglabrous leaves and the (sometimes) glabrous ovary of var. *ciliatum*. As already mentioned, var. *chrysotrichum* has sometimes trifid or tricrenate bracteoles; and with the large trilobate bracts occurring in some forms of *D. viscosum* it would not be astonishing if the bracteoles should here and there assume a similar form. The locality (probably the Jongri district) and elevation agree well with the supposition that *D. trilobatum* is probably only an aberrant form of var. *ciliatum*.

PLATE 123. *Dhelphinium viscosum:* H. f. and Th. 1, var. *ciliata*, upper part of flowering stem; 2, var. *gigantibractea*; 3—7, var. *ciliata*; 3, nectariferous staminode; 4, petaloid staminode; 5, base of the same; 6, stamens; 7, pistil; 8, pistil of var. *gigantibractea*; 9, stigma; 10, follicle of var. *ciliata*; 11, seeds of the same.

DELPHINIUM SPECIOSUM *M. Bieb.*, *subsp.* RANUNCULIFOLIUM.

Provided Turczaninow assigned to the term *lamellato-rugosus* the same significance that is attributed to it by Boissier and other botanists, he would have been the first to draw attention to the fact that two species, very similar in most respects, but radically differing in the structure of the testa of the seeds, have been confounded under the name *D. elatum*, Linn. On page 75 of his *Flora baicalensis* he enumerates among the diagnostic characters of *D. elatum*, "semina lamellato-rugosa lamellis imbricatis"; and in a note on page 76 he says: "*D. cuneatum* Stev. *semina habet compresso-triquetra angulis alatis et hoc charactere a varietatibus D. elati bene distinguitur.*" It is, however, possible that Turczaninow did refer to seeds which are puckered into true transverse wrinkles, as often seen in *D. grandiflorum*, *D. cheilanthum*, *D. stapeliosmum*, and especially in various forms of the real *D. elatum*. Boissier ascribed at first to *D. flexuosum*, M. Bieb., *D. dasycarpum*, Stev., and *D. speciosum*, M. Bieb. "*semina ad angulos alata*"; and it was Ruprecht who first, in his *Flora Caucasi*, showed that the last-named forms have lamellate, rugose seeds, and that it is precisely this character by which the group of *D. speciosum* is sharply distinguishable from that of *D. elatum*. To the former group belongs also the origial *D. ranunculifolium* of Wallich, in which the epidermis of the seed is thrown into transverse wrinkles at an early stage of development, these wrinkles gradually developing into imbricate scariose scales like those seen in *D. kashmirianum*, *D. incanum*, or *D. camptocarpum*. Some of the forms, however, included under the varietal name of *D. ranunculifolium* in the Flora of British India are true *Delphinium elatum*; as, for instance, the *D. Hoffmeisteri* of Klotsch, which should go to form a subspecies of *D. elatum* co-ordinate with the *D. incisum* of Wallich. The Indian varieties of *D. ranunculifolium* differ so much in the nature of their indumentum, in the size of the flowers, in the position and shape of the bracteoles, and in the size of the follicles and the relative length of spur and sepals, that the reduction of *D. flexuosum*, M. Bieb., *D. dasycarpum*, Stev., and perhaps of *D. formosum*, appears to be unavoidable. *D. Poltaratzkii*, Ruprecht, is known to the writer only from Ruprecht's description, but it seems closely related to some forms of *D. ranunculifolium*. Dr. Huth had the kindness to point out to the writer, who has verified the statement, that the sepals of *D. speciosum* are hairy on the inside, and that this species can thereby be distinguished from allied forms. And indeed all the specimens of *D. ranunculifolium* examined by me share that characteristic with *D. speciosum*. The fact, however, that in *D. incisum*, Wall., the sepals are either all of them glabrous, or all of them pubescent, or some of them glabrous and some pubescent, on the inner surface, appears to throw doubt on the diagnostic value of that character.

We subjoin a detailed description of *D. ranunculifolium*, (sp. of Wall.,) as far as this form is known at present.

A perennial herb. Rhizome descending, subcylindric, with filiform rootlets. Stem erect, straight or flexuous, terete or angular, striated or sulcate, fistulose, when flowering 30 to 100 cm. high (sometimes probably even higher), 4—8 mm. thick near the base, glabrescent below, upwards either subglabrous, or hirsute with shining deflexed or spreading longish hairs; floral axis usually densely pubescent with white or yellowish crisp hairs usually intermixed with glandular hairs. Branches patulous, the lower ones sometimes 40 cm. long. Leaves from very long-petioled below to short-petioled upwards, with slender, beneath prominent, nerves; petioles slender, hardly dilated at the base

(rarely distinctly sheathing), hirsute to subglabrous, 8—15—40 cm. long, lower ones usually about twice as long as the lamina; blade of a firm texture, broad-reniform to broad-ovate in outline, of lower and middle leaves 8—15 cm. long, tripartite to $\frac{3}{4}$ or $\frac{4}{5}$, cordate with the sinus triangular or semiorbicular, beneath pale, nearly glabrous at both surfaces or subtomentose beneath or more or less pubescent above, or beset with stiff hairs, especially along the nerves beneath; segments spreading, lateral ones trapezoid, unequally bifid, the middle and intermediate divisions ovate-oblong or deltoid or rhomboid or oblong-lanceolate in outline, all of them bipinnately cleft and incised-serrate or crenate-serrate, serratures from broad-ovate to lanceolate, callose-apiculate; upper leaves sometimes lanceolate, incised-serrate. Inflorescence racemoso-paniculate; racemes 8—15, but also 60 cm. long. Bracts at the base or higher up on the pedicel, broad-lanceolate, oblanceolate or linear, acute or sub-obtuse, 6—20 mm. long, hairy, more or less ciliate. Bracteoles usually close to the flower, broadly lanceolate to linear, 5—15 mm. long, ciliate. Sepals spreading or patulous, 12—20 mm. long, 3—5-nerved, blue or (more rarely) purple, hairy on both sides; lamina of posterior sepal ovate, obtuse; spur ascending or horizontal, about as long as the lamina or distinctly shorter, conical, straight or little curved; lateral sepals ovate or elliptic, rounded, anterior ones elliptic-oblong, obtuse or rounded. Staminodes bluish-black, shorter than the sepals; lamina of nectariferous staminodes bidentate or subcrenate at the tip, spur open on the inner side to about one-half, and here often minutely pubescent, subulate below; lamina of petaloid staminodes asymmetrically ovate, deeply and unequally bifid, 5—8 mm. long, upper surface villously bearded, margins ciliate, lower surface subglabrous; claw about as long as the lamina. Stamens about 30—40, about half as long as the sepals, glabrous; filaments lanceolate below, subfiliform above, 5—7 mm. long; anthers ellipsoidal, 1 mm. long. Pistils 3, rarely 4, 5—8 mm. long; ovaries ovate-oblong, 3—6 mm. long, pubescent, or glabrous except the sutures; style filiform; stigma shortly bilobed. Follicles 3 (or 4), ovoid or usually cylindric, chartaceous, reticulate, 8—25 mm. long, truncate at the apex, glabrous or hairy. Seeds numerous, obpyramidate, dorsally broader, covered with scariose, scale-like, epidermal wrinkles, 1·5—2·5 mm. long.

Flowers in August and September.

From Baltistan to Nipal, extending probably westwards into the Hindu Kush and northwards into Tibet.

Var. α. BRACHYCENTRA, *P. B.*; stem more or less flexuose, upwards with short spreading hairs; (upper) leaves reniform, rather sparsely pubescent on both surfaces; pedicels much longer than the flowers, suberect, stout; bracteoles close to the flowers, linear or oblanceolate; sepals 17—25 mm. long; spur often subrecurved, subulate, $\frac{1}{2}$ to $\frac{2}{3}$ the length of the sepals; follicles cylindric.—Western Tibet (*Herb. Falc. !*); Gilgit (*Giles*: *D. vestitum !*).

Var. β, ERIANTHA, *P. B.*; stem puberulous, pubescent in the upper part of the floral axis; leaves reniform, very coarsely and triangularly serrate, little hairy on both sides; pedicels ascending, stout, much longer than the pale blue flowers; bracteoles oblanceolate-linear, usually alternate, rather remote from the flower; sepals patulous, with long soft white hairs; spur distinctly shorter than the sepals, stout, conical, obtuse; follicles 3—4, ovoid, about 1 cm. long.—Flowers in August.—Kashmir: Kamri Pass, 12—13,000′ (*Duthie !*).

Var. γ. THYRSANTHA, *P. B.*; stem glabrescent below, floral axis densely pubescent; leaves ciliate, otherwise rather sparsely and coarsely hairy or nearly glabrous, reniform or isodiametric; pedicels patulous, many times longer than the flowers, rather slender; bracteoles ovate or broad-lanceolate, close to the flowers; sepals about 2 cm. long, pubescent,

blue, patent; spur, stout conical, often nearly as long as the sepals, blunt, as a rule incurved; follicles cylindric, about 2–5 cm. long.—Flowers in July and August.—Kashmir: Liddar valley, 9—11,000′ (*Duthie !*).

Var. δ. LASIANTHA, *P. B.*; stem glabrescent below, floral axis tomentose; upper surface of leaves densely adpressed-hairy, lower hirsute; leaf-segments rhombic or broadly oblong, cleft and unequally incised-serrate, serratures linear; bracteoles somewhat remote from the flowers, broad-linear; buds silky-villose with white hairs; spur about as long as the sepals, subincurved; ovaries minutely and densely pubescent, hairy at the tip.—Kumaon; Dhauli valley, 9—10,000′ (*Duthie !*).

Var. ε. PULVERULENTA, *P. B.*; stem glabrescent below, floral axis densely minutely pubescent; leaves subisodiametric, puberulous above, like the pedicels densely minutely pubescent (indumentum resembling a fine powder); pedicels suberect, not longer than twice the length of the spur; bracteoles close to the flowers, small, linear; sepals 12–15 mm.; spur subulate, incurved at the apex, rather longer than the sepals; carpels pubescent.—Eastern Kashmir, on slates and sandstones in the Marbal pass (*Stoliczka !*); Garhwal. (*Falconer !*).

Var. θ. OINOPHYLLA, *P. B.*; stem glabrescent below; floral axis velvety with short, spreading, partly glandular hairs; petioles subhirsute; leaves broadly ovate, pubescent above, subtomentose below; leaf-segments oblong-lanceolate, pinnately cleft, coarsely crenate-serrate; bracteoles close to the flowers, narrow-lanceolate, acute; sepals purple, 12—15 mm.; spur subulate, rather longer, subincurved; follicles cylindric, sparsely hairy.—Kashmir: Singpur, 8,000′ (*C. B. Clarke !*).

Var. η. MARRIENSIS, *P. B.*; stem glabrescent below, otherwise (like the petioles) hirsute, with white, shining, deflexed, rather soft, partly glandular hairs; leaves adpressed-hairy above, hirsute beneath, especially along the nerves; leaf-segments broad-lanceolate, pinnately cleft, coarsely and acutely serrate; bracteoles linear; sepals hairy; spur incurved; ovaries subvillose along the ventral, subhirsute along the dorsal suture, otherwise subglabrous.—Panjab: Himalaya, near Marri (*Drummond !*).

Var. ϛ. KATATRICHA, *P. B.*; stem subglabrous downwards, upwards hispid, with white, shining, subrigid, deflexed hairs, indumentum denser but shorter towards the apex and intermixed with bulbous hairs; leaves hairy above, sub-hirsute beneath, especially along the nerves; middle leaf-segment deltoid-oblong, sparsely cleft, coarsely crenate-serrate; bracteoles close to the flowers, lanceolate, acute; sepals pubescent, 1·5 cm., long, spur subcylindric, blunt, slightly incurved, about as long as the sepals; ovaries pubescent.—Kumaon, in the Rālem valley, 10—11,000′ (*Duthie !*).

From *D. speciosum* and allied forms *D. ranunculifolium* is distinguished by the ultimate leaf-segments being nearly always broad, ovate, with triangular serratures, not lanceolate or linear, except in var. *lasianthum*, which has incised partitions, the serratures being linear. The existence of this variety appears to render the reduction of *D. ranunculifolium* to *D. speciosum* imperative.

PLATE 127. *Delphinium speciosum*, M. Bieb. subsp. *ranunculifolium*. fig. 1—5, flowers; 1, 2 of *D. speciosum* from the Caucasus; 3, of *D. speciosum* from Tabriz; 4. subsp. *ranunculifolium*, var. *erianthum*; 5, of var. *thyrsantha* with reniform leaves; 6, hairy inner surface of anterior sepal of var. *brachycentra* from Gilgit; 7, petaloid staminode; 8, follicle of var. *eriantha*; 9, of var. *thyrsantha*; 10, seeds (*a*) from var. *thyrsantha*, (*b*) from var. *eriantha*, (*c*) from var. *oinophylla*.

DELPHINIUM PACHYCENTRUM, *Hemsl.*

Stem erect, simple or somewhat branched upwards, stout, subangular; leaves rather crowded, isodiametric, 5-partite; inner segments oblong-lanceolate, more or less pinnately cleft, incised, and serrate; petioles not sheathing; inflorescence a dense or somewhat lax raceme, rarely subcorymbose; pedicels erect or patulous; sepals bluish, softly hairy;

sepaline spur stout-cylindric or thick-conical, slightly incurved, very blunt, as long as, or longer than, the lamina; staminodes shorter than the sepals; lamina of anterior staminodes light blue, orbicular, subentire; carpels 3—5.

Distribution: Eastern Tibet, from the northern frontier of Sikkim to Setchwan.

The variety from Southern Tibet was figured by the writer about three years ago for the present volume of the Annals under the name of *D. Kingianum*; on receiving Pratt's plants he at once recognised the close relationship between the form in question and a new *Delphinium* gathered in the Tachienlu region. Meanwhile Mr. Hemsley described the latter under the name of *D. pachycentrum*, for which reason the writer has, by the kind permission of Dr. King, substituted a new plate for the original one and rechristened the Southern Tibetan form subsp. *tsangense*. We have thus—

Subspecies I.—HEMSLEYI; stem very stout (7—9 mm. in the middle), like the pedicels densely pubescent with minute retrorse crisp hairs; inflorescence strictly racemose; flowers crowded; pedicels erect; sepals on both sides minutely and softly pubescent; sepaline spur about $\frac{2}{3}$ the length of the lamina, stout-cylindric, blunt; lateral sepals obovate-oblong; carpels usually 3 or 4.—Tachienlu region (*Pratt !*).

Subspecies II.—TSANGENSIS, *P. Brühl*; stem rather slender (3—5 mm. in the middle), glabrescent below, upwards hairy, more or less glandular; inflorescence racemose, subpaniculate or subcorymbose, somewhat lax; pedicels patulous; sepals glabrous inside, the anterior ones and posterior one hairy all over on the outside, the lateral ones puberulous along the middle; sepaline spur about as long as, or very slightly shorter than, the lamina, stout cylindric; carpels usually 5, more rarely 3.—Between the northern frontier of Sikkim and Lhassa (*King's collector !*).

Var. α. DASYCARPA *P. B.*; ovaries villose-pubescent.

Var. β. LEIOCARPA, *P. B.*; ovaries quite glabrous or slightly ciliate along the ventral suture.

Description of subspecies tsangensis.—Stem lerect, subflexuose, subangular, densely foliose upwards, glabrescent downwards. Upper infrafloral leaves shortly-petioled; blade of firm texture, subpentagonal in outline, cordate, nearly isodiametric, trisect, pubescent, especially along the margin and the nerves; middle segment oblong-lanceolate, towards the base cuneate, 3—4 cm. long, 12—15 mm. broad, pinnately trifid, acute; middle lacinia $\frac{1}{2}$ the length of the segment, incised with 2 or 3 serratures on either side; lateral laciniæ twice or three times shorter, obliquely ovate, pauciserrate; lateral leaf-segments trapezoidal, very broad-cuneate, unequally bipartite beyond the middle, 25—32 mm. broad; intermediate partitions similar to the middle segment; outer ones broader, unequally bifid, sparsely incised-serrate; all serratures apiculate; petioles not dilated at the base, semiterete, canaliculate, 15—5 mm. long, hairy, sparsely glandulose. Inflorescence many-flowered, 4—12 cm. long; flowers on the lateral branches rather crowded. Floral axis beset with glandular and eglandular hairs. Floral leaves subconform to lower ones, but gradually more shortly petiolate, the uppermost ones rather more simple. Pedicels patulous, terete, lower ones 2·5—5 cm. long, uppermost 1—2·5 cm. long, indumentum like that of floral axis, towards the apex bibracteolate and villous. Bracteoles opposite, linear, acute, 6—11 mm. long, hairy. Sepals membranous, pale blue. Sepaline spur obtuse, sometimes 2 mm. shorter than the lamina. Nectaries glabrous; lamina oblong-subspatulate, 2—4 mm. shorter than the lamina of the posterior sepal, obtuse, entire; spur about as long, open laterally to about the middle, below the slit subulate, acute. Anterior staminodes hairy on the back, lamina 6—7 mm. long, about as long as the claw. Stamens 25—30, subequal, 7—9 mm. long; filaments membranous, dilated below, with the wings attenuated upwards and ciliate; anthers elliptic, 1 mm. long. Carpels 5, rarely 3, 5—7 mm. long; ovary ovoid-oblong; style about 2 mm. long, at first straight but finally recurved. Ovules numerous.

PLATE 128. A. Subspecies *Hemsleyi*, Tachienlu region. B. *Delphinium pachycentrum*, Hemsl. subspecies *tsangensis* Tibet. 1, anterior, 2, lateral, 3, posterior sepals, (*b*) inner, (*b**) outer surface; 4, petaloid staminodes; 5, nectariferou staminodes; 6, gynœcium, (*a*) of subspecies *Hemsleyi*, (*β*) of subspecies *tsangensis*, var. *dasycarpais*, (b,* b**) of var. *leiocarpa*; 7, upper extremity of style; 8, stamens.

ACONITUM FEROX, *Wall.*

(A. ferox, *Wall. in Seringe Mus. Helv. I*, 160; *DC. Prodr. I*, 160; A. virosum, *Don*; "A. ferox et A. atrox, *Wall. in litt.*": *Don*, *Prodr.*; A. palmatum, *Don*, *Prodr.*; A. lethale, *Griff. Notul.*)

Stem entirely simple or branched upwards, erect; leaves reniform, orbicular, more rarely ovate, usually cordate, 5—7-lobed or partite, sometimes trisect; inflorescence racemose or racemose-paniculate; helmet more or less vaulted, more rarely navicular; nectaries included, claw longer than spur, spur conical with terminal globose recurved tip, more rarely saccate, club-shaped, or subglobose; labellum bilobed or marginate, very short or oblong; follicles subcylindric; seeds obpyramidal, epidermis folded into transverse sinuous scariose wrinkles of various width.

Flowers from July to September.

Distribution: Temperate Himalaya: Kashmir; Garhwal to Sikkim; Chumbi and Phari.

Subspecies I. MOSCHATUM, *P Brühl*; stems simple; leaves reniform; flowers musky; sepals purplish-brown; helmet navicular; nectaries slightly recurved at the apex; spur broadly and shortly saccate, very obtuse; labellum about as long as the spur, obovoate, nearly entire; follicles about 2 cm. long; seeds broadly obpyramidate, with broad scariose wrinkles.—Kashmir: on rocks, Sonsa nallah, Liddar valley, 13—14,000′ (*Duthie !*); Musjid valley, 12—13,000′ (*Duthie !*).

Flowers in July.

Description of subspecies I.—Rhizome fusiform or irregularly cylindric. Stem erect, simple, straight, terete, 50—90 cm. high, about 4—9 mm. thick near the base, glabrescent below, more and more densely hairy upwards, subtomentose with yellowish hairs along the floral axis. Leaves all or most of them basal, very long-petioled, palminerved with the nerves little prominent on the lower and much paler surface, reniform in outline, breadth $\frac{3}{2}$—$\frac{5}{3}$ of length, palmately tripartite to $\frac{1}{2}$ or $\frac{3}{4}$, ciliate, puberulous above, subglabrous below except nerves; lateral segments rounded-subtrapezoidal, unequally 3—4-lobed, middle segment three-lobed upwards; lobes broadly cuneate, coarsely dentate-crenate, crenatures subobtuse, apiculate; petioles sheathing at the base, rounded upwards, striate, usually 20—30 cm. long, somewhat hairy; infrafloral cauline leaves, where present, similar to the basal ones. Inflorescence strictly racemose, usually lax, many-flowered; floral leaves short-petioled below, sessile upwards; the lowest trisect or deeply tripartite, segments entire or cleft, upper ones bract-like, lanceolate, diminishing in size upwards; pedicels erect, the lowest much longer than the upper ones, about as long as the flowers, densely villose-pubescent; bracteoles inserted above the middle, linear-lanceolate, 8—12 mm. long. Flowers musky. Sepals rather spreading, purplish-brown, outside rather densely covered with coarse yellowish hairs; helmet navicular, attenuated downwards, scarcely produced at the apex, 13—16 mm. high, lower part erect; lateral sepals broadly obovate, about 12 mm. long, 8—9 mm. broad; anterior ones unsymmetrically elliptic, obtuse, 9—10 mm. long, 5—6 mm. broad. Nectaries erect, somewhat recurved upwards, glabrous; claw linear, dilated upwards, 8—9 mm. long; spur broadly and shortly conical, very obtuse, 4—5 mm. long; labellum spreading, about as long as the spur, obovate, scarcely emarginate. Stamens not very numerous, laterally enclosed; filaments 5—6 mm. long, membranously dilated from the middle downwards, subfiliform upwards, the dilated part attenuate; anthers subglobose, 0·8 mm. long, dark-coloured. Pistils 3, erect, 5—6 mm. long; ovaries oblong, densely hairy; style shorter than the ovary. Follicles subparallel, ovoid at the base, subcylindric upwards,

rounded at the apex and attenuated into the persistent style, reticulately veined, more or less hairy. Seeds obpyramidal, three-sided, about 2 mm. long; testa black; wrinkles conspicuously scariose.

This is a species of the second rank; it is, however, closely allied to the group of forms included in subspecies II, but somewhat more distantly related to *A. palmatum.*

Subspecies II. FEROX PROPRIUM (*A. ferox,* Wall.); stems simple below, branched or simple upwards; leaves mostly suborbicular or ovate, more rarely reniform; flowers not musky; sepals variously coloured; helmet vaulted, rarely navicular; nectaries slightly or distinctly recurved upwards, often hairy; spur usually conical with more or less recurved capitate apex, rarely cylindrical and obscurely capitate or subglobose; labellum oblong or spatulate, $\frac{1}{3}$—$\frac{1}{4}$ the length of the spur, emarginate or bilobed; follicles 13—26 mm. long; seeds broadly obpyramidal, with broad scariose transverse wrinkles.

The following varieties can at present be distinguished:—

Var. a. SPICATA, *P. B.*; floral axis and pedicels subtomentose with spreading hairs; leaves isodiametric or broadly ovate, sometimes reniform, 5-partite, divisions pinnately cleft and incised; flowers 20—35, in an elongated, mostly simple, narrow raceme (inflorescence rarely subcorymbose); pedicels strictly erect; spur of nectaries conical, capitate, recurved; follicles short-cylindric, densely hirsute when young.—Garhwal (*Falc.!*); Nipal (*Scully!*); Sikkim, on Sandakphu, Phullut, Phullalong, Tonglu (*Kurz, King, T. Thomson, C. B. Clarke!*); S. E. Tibet (*King's Collectors!*).

Var β. LAXIFLORA, *P. B.*; floral axis and pedicels subtomentose; leaves broadly ovate to broad-reniform, deeply tripartite, lateral segments unequally bipartite, divisions cleft and incised, laciniæ lanceolate; flowers 2 or moderately numerous, disposed in a very lax raceme or panicle; pedicels long, stout and spreading; spur of nectaries conical, hooked at the tip; follicles as in *a.*—Sikkim: Sandakphu (*Gamble!*); S. E. Tibet (*King's Collectors!*).

Var. γ. HETEROPHYLLOIDES, *P. B.*; floral axis densely pubescent; cauline leaves ovate-cordate, 8—10 cm. long, 6—7 cm. broad, sub-3-partite, middle division 5—6 cm. long, ovate-lanceolate, nearly twice as long as the lateral ones, more or less pinnatifid and serrate; inflorescence many-flowered, racemose-paniculate, terminal raceme elongate; floral leaves similar to the cauline ones; helmet erect, high; nectaries with conical capitate hooked spur and densely hairy claw; follicles somewhat spreading, when young hirsute.—Sikkim: on Singalela and Phullalong (*Clarke!*).

Var. δ. ATROX, *Wall.*; floral axis densely pubescent; leaves nearly isodiametric, 5-partite, divisions pinnatifid and serrate-incised, rarely incised-crenate; flowers usually dark-blue, in a rather short, somewhat dense, 10—15-flowered raceme; pedicels erect-patulous; helmet much vaulted, not gaping; spur of nectary conical, capitate, recurved; follicles cylindric, 18—24 mm. long, pubescent.

Subvar. aa. lacinulæ acute: (*Wall. cat.* 4721 *C!*); Garhwal, above Bhowani 13—14,000′ (*Duthie!*) Kumaon (*Wall. cat.* 4721*C!*), in the Rālem valley (stem sometimes reddish, *Duthie!*); Sikkim (*T.T!*).

Subvar. ββ. lacinulæ subobtuse: Nipal, on Nampa Gadh 12—13,000′ (*Dhutie!*), Gosain Thān (*Wall. cat.* 4721 *B!*).

Var. ε. LEUCANTHA, *P. B*; stem 30—80 cm. high, rather thin, 3—4 mm. near base, glabrescent below, densely pubescent with soft crisped hairs upward; leaves thin, rather small, broad-ovate to subreniform, deeply 3-partite, lateral divisions less deeply bipartite, partitions often conspicuously pinnatifid and incised, lacinulæ subobtuse apiculate; inflorescence a 4—10-flowered, usually lax raceme; pedicels subtomentose, erect, slender; sepals white, or white and blue or greenish-blue; helmet vaulted, rarely subnavicular.—Sikkim: Jongri, Ling-tu, Jongri-Pokri, Ten-chang (*King's collectors!*).

Var. ζ. CRASSICAULIS, *P. B.*; stem 1—1·5 m. high, densely pubescent with fine crisp hair, more rarely velvety with rather coarse spreading hairs, 1—1·5 cm. thick near base; leaves firm, nearly isodiametric, tripartite, divisions pinnatifid, laciniæ broadly-oblong, serrate or crenato-serrate, nerves prominent below; flowers numerous (20—30 in terminal raceme),

forming a simple or compound, rather dense raceme; pedicels slender, spreading, inarcuate, finally recurved at tip; sepals dark-blue; helmet usually much vaulted; spur of nectaries broadly conical, hooked, capitate, glabrous; ovaries densely hirsute.—Sikkim: Thunku, 12,000′ (*King's collectors!*); Lachung valley, 12,000′ (*Gammie!*).

Var. η. LANCEIFIDA, *P. B.*; stem glabrescent below, densely hirsute upwards; leaves reniform, sub-5-partite, divisions rather sparsely pinnatifid, laciniæ broad-lanceolate, entire or scarcely incised; inflorescence short, racemose, rather dense; sepals pale-blue; helmet semicircularly vaulted; ovaries densely hirsute.—Kumaon: in the Rálem valley (*Duthie!*).

Var. θ. LACINIATA, *P. B.*; stem upwards puberulous or pubescent; leaves nearly isodiametric trisect, lateral segments deeply bipartite, all divisions duplicate-pinnatifid beyond the middle; laciniæ and lacinulæ lanceolate-linear or linear acute or acuminate; inflorescence racemose, rather dense; pedicels erect-patulous or ascending, rather slender, densely pubescent; sepals dark-red (perhaps also blue); helmet semicircularly vaulted, beak usually conspicuous; spur of nectaries conical capitate and recurved at the tip, claw densely hairy; ovaries hirsute; follicles cylindric, about 24 mm. long, minutely pubescent.—Garhwal: Massūri range (flowerless specimens); Kumaon: Rālem valley (*Duthie!*); Sikkim: on the Sandakphū, 12,000′; in the To-ko-lā and Cho-lā (*King's collector's!*). To this variety appears to belong "Caltha? Nirbisia" of Buchanan-Hamilton, *Wall. Cat.* 5721 *D.*—In habit, in form of leaves and in flowers, *A. ferox laciniata* closely approximates *A. Kusnetzoffii* Rchb., var. *A typica*, Regel (*Reichenbach, Ill. Sp. Ac. Gen., tab. XXI; Regel, Ostsibirien, page* 94), which has a wide distribution in Northern Asia; it differs from the latter by the pubescence of the floral axis pedicels and carpels, and by its conical, not dome-shaped, nectarial spur, which is hooked at its very tip.

Var. ι. FLAVIDIFLORA, *P. B.*; flowering stem 20—60 cm. high, 2—5 mm. thick, upwardt puberulous or villose-pubescent; leaves reniform, 2·5—6 cm. broad, 5-partite, middle and intermediate divisions pinnately cleft and serrate, laciniæ oblong as ovate, serratures subacute; inflorescence 2—many-flowered, racemose as racemose-paniculate; pedicels erect or patulous, thick or slender; sepals pale yellow or greenish-yellow; helmet semicircular; spur of nectaries conical, capitate, much hooked, claw as well as the filaments hairy; ovaries pubescent; follicles 14—24 mm. long, more or less hairy.—Chumbi: at Me-rik-lā and Tu-key-kung (*King's collectors!*).

Var. κ. CYMBIFORMIS, *P. B.*; stem quite simple, glabrescent downwards, densely pubescens on the floral axis; leaves small (2—6 cm. broad), subisodiametric, deeply tripartite, lateral segments unequally but less deeply bipartite, divisions pinnately cleft and incised, lacinulæ rather acute; inflorescence 5—9- flowered, racemose, lax; sepals blue; helmet navicular; spur of nectaries conical, hooked, tip globose.—Sikkim: near Tha-pa, 13,000′ (*King's collectosr!*).

Var. λ. NAVICULARIS, *P. B.*; stem glabrescent below; floral axis and pedicels, pubescent, 2—3 mm. thick near base; leaves small (about 3 cm. broad), subreniform, deeply 3-partite, lateral segments deeply 2-lobed, all divisions 2—3-lobed, laciniæ sparsely incised, lacinulæ blunt; inflorescence lax, rather few-flowered; pedicels erect, rather slender; sepals reddish blue; helmet navicular; spur of nectaries globose, shorter than the obovate emarginate labellum.—Chumbi: near Kung-met.

Subspecies III. PALMATUM, (*Don pro sp.*); stem simple below; upwards usually branched; leaves reniform, rarely subisodiametric; flowers not musky; sepals greenish-blue, or partly white, partly blue; nectaries slightly recurved; spur club-shaped more rarely subglobose, labellum 3—5 times shorter, emarginate; follicles 25—35 mm. long, glabrous or more rarely pubescent; seeds narrow-obpyramidate, testa black, epidermal wrinkles narrow.—Garhwal (*Herb. Falc. No.* 68!); Nipal (*Wall. Cat.* 4723 *A!*); Sikkim: (*Hook fil.!*); on Tonglū (*Kurz, Anderson!*), Phullalong (*Clarke!*), Phullut (*T. Thomson!*), Nā-tong (*Pantling!*); Phari: near Gūp (*King's Collectors!*).

The only reliable character by which *A. palmatum* can be distinguished from *A. ferox* is the form of the seed and the width of the transverse wrinkles; but sometimes the wrinkles of the seeds of *A. palmatum* are rather wider than they are commonly; so that it appears preferable to consider *A. palmatum* a subspecies of *A. ferox*. The geographical distribution of the two is about the same.

PLATE 111. *Aconitum ferox*, Wall. (A) flowering plant of subsp. *moschatum*, from Kashmir. 1, flower of subsp. *moschatum*, cut longitudinally. 2—10, flowers, natural size, 2—8 of *A. ferox proprium*; 2, var. *navicularis*, Chumbi; 3, var. *cymbiformis*, Tha-pa, Sikkim; 4, var. *flavidiflora*, Jongri; 5, var. *flavidiflora*, Me-rik-lā; 6, var. *spicata*, Tsang, Tibet; 7, var. *laciniata*, Cho-lā, Sikkim; 8, var. *laciniata*, To-ko-lā, sepals dark red; 9, subspecies *palmatum*, Gūp, Phari. 10, subspecies *palmatum*, Phullūt; 11—19, nectaries: 11—13 of *A. palmatum*: 11, Nipāl; 12, Gūp; 13, Tonglū. 14—19 of *A. ferox proprium*: 14, var. *navicularis*, Kung-met; 15, var. *atrox*, Garhwal; 16, var. *laxiflora*, Sandakphū; 17, var. *laciniata*, Cho-lā; 18, var. *heterophylloides*, Singalelā; 19, var. *flavidiflora*. 20—25, ripe follicles: 20, *A. moschatum*; 21, *A. ferox spicata*; 22, *A. ferox flavidiflora*; 23, *A. ferox atrox*; 24, 25, *A. palmatum* 26—31, seeds: 26, *A. moschatum*; 27. *A. ferox flavidiflora*; 28, *A. ferox laxiflora*; 29, *A. ferox spicata*; 30, *A. ferox laciniata*; 31, *A. palmatum*, Sikkim.

ACONITUM LURIDUM, *H. f. et T.*

(*Hook. fil. Flora Indica* 55; *Flora of Brit. Ind., vol. I, p.* 28.)

Rhizome irregularly cylindrical; stems simple, erect; leaves subreniform, palmately tripartite or trisect with the segments deeply cleft and incised-serrate; inflorescence racemose, many-flowered, axis densely hairy; posterior sepal with hemispherical dorsal prominence and long produced beak; base of stamens enclosed; nectaries mallet-shaped with oblong bifid labellum and short broad claw; follicles 3, ovoid; seeds three-sided, with convex back and the dorsal edges winged, otherwise smooth.

Distribution: Alpine regions of Sikkim and Chumbi. On Phulut, at the To-ku-lā, Zē-lap-lā, Tang-ka-lā (*King's collectors !*), Tankra et Cho-lā (*Hooker fil. !*); in Chumbi, near Tuck-e-kung (*King's collectors !*). Flowers in August and September.

Description.—Rhizome often branched, covered near the apex with the bases of fallen leaves. Stems slender, subcylindric, when flowering 36—70 (even 90) cm. long; near the base 3—5 mm. thick, beset with spreading hairs. Infra-floral leaves crowded near the base; blade in the outline suborbicular or reniform, cordate at the base; 2·5—8 cm. long, 5—10 cm. broad, on the upper surface sub-adpressedly hairy, lower surface less hairy, nerves more densely pilose; middle segment obovate oblong, broad-cuneate, upwards deeply pinnately trifid; lateral segments trapezoidal, unequally bipartite, inner division similar to the middle segment, outer shorter unsymmetrically bifid; all segments coarsely crenate-serrate, serratures apiculate; petioles moderately dilated at the base, canaliculate, hairy, basal ones 20—30 cm. long. Inflorescence usually simple, sometimes with a few spreading, lateral branches, 8—40 cm. long; floral leaves gradually diminishing from the lowermost tripartite to the uppermost linear-lanceolate one. Pedicels usually shorter than bracts and flowers, densely hairy, 0·5—1 mm. thick; bracteoles above the middle of the pedicel, opposite, narrow-lanceolate, 2—3 mm. long. Sepals brownish-purple, or pale red, inside sometimes yellowish; posterior one subcompressed, densely hairy, 6—8 mm. high, 10—12 mm. wide with the dorsal process dome-shaped and either hemispherical or hemispherical with short cylindric base, process 4—6 mm. high, 5—6 mm. wide; beak horizontal or a little descendent, obtuse at the apex, sinuate at the margin; lateral sepals obovate cuneate somewhat asymmetric, 9—11 mm. long, 7—8 mm. broad, outside hairy, inside hairy near the end of middle nerve, otherwise hairy or glabrous; anterior sepals 7—8 mm. long, obtuse, one obovate, the other subspatulate.

Nectariferous staminodes enclosed, erect, hammer-shaped, glabrous; claw 3—5 mm. long, conduplicate, straight, broader towards the base; spur 1·2—1·8 mm. long, capitate, forming an acute angle with the claw; labellum 2·5—3·5 mm. long, usually at right angles to the claw. Stamens about 20, outer ones 7—10 mm. long; filaments filorm above the middle, membranous-dilated below; anthers subglobose, about 1 mm. long. Pistils 3, erect, 4—5·5 mm. long; ovaries oblong-ovoid, densely hairy; style subcylindric, $\frac{1}{2}$—$\frac{1}{4}$ the length of the ovary; stigma shortly bilobed. Follicles subdivergent, chartaceous, obovoid-subcylindric, crowned with a short style, 8—10 mm. long, 3—4 mm. broad near apex, hairy or glabrescent. Seeds about 5—6.

PLATE 124. *Aconitum luridum*, H. f. and Th.—1, flowering plant; 2, anterior; 3 lateral; 4 posterior sepal; 5, posterior sepal cut open and flattened out; 6, nectary; 7, stamens; 8, pistils; 9, upper part of style; 10, follicle; 11, seed.

ACONITUM GYMNANDRUM, *Maxim.*

Rhizome fusiform, leaves bipinnatisect with the segments incised-serrate; inflorescence racemose, more rarely subcorymbose, many-flowered; sepals long-clawed, leaving the stamens uncovered, posterior one subnavicular; nectaries with broad claw, a shortly-cylindrical obtuse spur and a very large, protruding, semi-circular, dentate labellum; follicles 5—8; seeds narrow obpyramidal three-sided with narrowly and sinuously plaited testa.

Flowers in August.

Phari: Kang-mā, 60 miles north of the town of Phari; Ting (*King's coll.!*); Tachienlu region (*Pratt No.* 496, 507 !); Kansu.

Description.—Rhizome descending, fusiform or subcylindrical, 5—10 cm. long, sometimes branched. Stem usually short or of medium size, straight or ascending, simple or branched from the very base, 5—30 (—90) cm. high, near the base 3—4 mm. thick, leafy, glabrous or more or less covered with white longish hairs, upwards often villous. Leaves more or less hairy, the infra-floral ones long-petioled, crowded or rather remote; lamina bipinnatisect, about 3 cm. long, yellowish-green on the lower surface; primary segments petiolulate, lowest pair sub-bipinnatisect, upper ones pinnatipartite with the divisions spreading, incised and serrate, serratures apiculate. Inflorescence racemose or racemose-paniculate or in smaller specimens subcorymbose; racemes usually elongate, lax or rather dense; floral leaves mostly short-petioled, upper ones subsessile, lower subsimilar to the infra-floral leaves, upper ones narrower and simpler; pedicels erect or slightly spreading, during flowering time shorter than the flowers, afterwards elongating, the lowest finally 3·5—5 cm. long, 1—1·5 mm. thick; bracteoles near the base of the flower or somewhat remote, alternate or opposite, sessile or very shortly petioled, variously divided or undivided and linear. Sepals bluish-purple, long-clawed, sub-villous outside, deciduous; posterior one unguiculate-navicular, very shortly and obtusely rostrate, claw broad erect 9—11 mm. long, lamina more or less horizontal, about as long as the claw; lateral sepals about 15 mm. long with unsymmetrical suborbicular lamina and the claw 6—7 mm. long, about 2 mm. broad; anterior sepals spatulate, about 13 mm. long, lamina 4—5 mm. broad, obtuse at the apex, claw about 3 mm. broad near base. Nectariferous staminodes 2; claw nearly straight, flattened, broad-linear, hyaline at the edges, 12—13 mm. long, about 2·5 mm. broad; spur about 4 mm. long; labellum 5 mm. long, 9 mm. broad, dentate or crenate, reaching beyond the helmet. Stamens 40—50, unequal, 5—8, mm. long, persistent; filaments dilated below, coloured, ciliate; anthers subglobose, dark-blue. Pistils 5—8, mostly 8, erect, 4—5 mm. long; ovary ovoid-oblong, more or less villous; style

shorter; stigma shortly bilobed. Follicles with fine transverse veins membranous, cylindric, rotundate-truncate at the apex, 8—9 mm. long, somewhat hairy, style persistent, straight, erect, 2—2·5 mm. long. Seeds about 2 mm. long, ventral side narrowly keeled, sides slightly convex, testa black.

PLATE 125. *Aconitum gymnandrum*, Maxim 1. small sized specimen; 2, helmet; 3, lateral; 4, anterior sepal; 5, nectary; 6, stamen; 7, pedicel with bracts and carpels; 8, seed; 9, ripe follicle.

PAEONIA MOUTAN, *Ait.*

(*Ait. Fl. Kew. ed.* 2, *vol. III, p.* 315, 1811; *DC., Prodr. vol. I, p.* 65; *Sims, Bot. Mag. t.* 1158; *Anderson, Mon. in Tr. Linn. Soc. XII, p.* 252; *Huth, Mon. in Engler Bot. Jabrb. XIII, p.* 272.)

Stem branched, base of annual shoots covered with scales, leaves sub-bipinnately or biternately divided, lateral leaflets lobed or entire, terminal ones 3—5-lobed or cleft with the lobes ovate, petals 8 or more, rarely 5—7, carpels 5, subtomentose with coarse short hairs, disc urceolate finally usually irregularly split, follicles divergent.

Subspecies ATAVA, *Paul Brühl*, petals 5—7 (—8), 4—7 cm. long, suborbiculate.

Description.—Annual shoots alternate, covered at the base with numerous imbricate many-veined ovate apiculate scales 6—20 mm. long, subcylindrical, glabrous. Leaves 4—6 on each branch, alternate, long-petioled, large, the uppermost ones often smaller and less divided, even trifoliate; blade 7—15 cm. long, primary divisions short-petioled, more or less distinctly ternately arranged, themselves usually pinnate and 5-foliolate, sometimes trifoliolate; leaflets herbaceous, the lowest pair very short-petioled, broadly ovate, subpinnately unsymmetrically and coarsely cleft and subserrate, rarely entire, without the petiolule 2—4·5 cm. long, 1·2—3 cm. broad; intermediate leaflets ovate- or elliptical-oblong, entire or scarcely incised-serrate, 2—4 cm. long, 1—2 cm. broad, always narrower than the remaining ones; terminal leaflets (3—) 4—5·5 cm. long, 2—5 cm. broad, trisect or tripartite or trifid, otherwise entire or the middle division again cleft or sparsely and coarsely serrate; all leaflets obtuse or subcuneate, more rarely quite cuneate at the base, subacute at the apex, glabrous, below subglaucous, nerves fine and scarcely prominent below; petioles semiterete or subterete, scarcely dilated at the base, 5—12 cm. long. Flowers solitary on the branches, terminal, large; peduncle strict, 1—6 cm. long. Bracts 3, inserted near the base of the calyx, in the same spiral with the calyx leaves and gradually passing into them, oblanceolate-subspatulate, the outermost 5—7 cm. long, sparsely incised or incisedly lobed, the innermost 4—5 cm. long quite entire, all of them again dilated at the base and glabrous. Sepals 5, herbaceous reticulately veined, 2—3 cm. long, inner ones a little smaller than the others, entire, glabrous, persistent, ultimately reflexed; the outermost oblanceolate conspicuously dilated at the base, the second from a broadish base long-acuminate, the third ovate long-acuminate, the fourth broad-ovate short-acuminate, the fifth suborbiculate with the shortly produced apex subtruncate. Petals 5—7 (—8?), membranous, traversed by much-branched nerves, broadly cuneate at the base, erose-sinuate at the margin, 7—8 cm. long, white with a rosy hue, with a large dark-purple spot near the base. Stamens numerous, gradually increasing in length inwards, the innermost projecting a little beyond the disc; filaments narrowly linear, coloured, outer ones about 4, innermost ones 10—17 mm. long anthers linear-oblong, apiculate, outer ones 2, inner ones 5—6 mm long.

Pistils 5, erect, about 2 cm. long, surrounded by the urceolate subglobose somewhat fleshy disc which is at first dentate at the apex and finally irregularly torn; ovaries ovoid-oblong, convex dorsally, ventrally nearly straight, attenuated upwards, covered with coarse brown hairs; stigma induplicate, veined, recurved, undulate, papillose along the edges, protruding from the disc. Follicles divergent, coriaceous, ovoid, tomentose.

Flowers in June.
Chumbi, near Tuk-chung (*King's collector!*).

Paeonia Moutan, sub-sp. *atava* differs from the typical *Paeonia Moutan* chiefly in the number of petals, which in the garden form are usually very numerous. The leaflets are smaller than those of the cultivated plant, but in this respect it stands between the latter and a variety from Japan. There appears to be no doubt about its growing wild in the Chumbi hills or of its being the ancestral form of the numerous garden varieties of *Paeonia Moutan*. From *Paeonia Delavayi*, Franchet, it is easily distinguished by the tomentose (not glabrous) carpels, and the ovate or ovate-oblong (not lanceolate or ovate-lanceolate) leaf-segments, which are not confluent.

PLATE 126. *Paeonia Moutan*, DC., subsp. *atava*. 1, annual shoot in flower; 2, head of immature follicles, discal envelope not yet burst; 3, inner stamen; 4, outer stamen; 5, carpel; 6, inner surface of one-half of the stigma; 7, hair from ovary, greatly magnified; 8, unripe seed; 9, innermost sepal.

PLATE 129.

TETRACERA GRANDIS, King in Journ. As. Soc. Bengal, for 1889, *pt.* 2, *p.* 363.
Nat. Ord. Dilleniaceæ.

A large tree. Young branches and inflorescence shortly velvety-tomentose. *Leaves* large, coriaceous, broadly elliptic, rarely slightly obovate, the apex truncate and minutely apiculate; the edges obscurely crenate or undulate toward the apex, entire below, recurved when dry; the base rounded or slightly narrowed: upper surface scabrous, lower minutely tomentose: nerves stout, 14 to 16 pairs, rather straight, erecto-patent; length of blade 8 to 11 in., width 5 to 6 in., petiole about ·7 in., stout. *Inflorescence* in little-branched, lateral or terminal panicles a foot or more long. *Flowers* shortly pedunculate. *Sepals* 5, broadly ovate, sub-acute, concave, ribbed and tomentose externally, ·5 in. long. *Petals* nearly as long as the sepals, but narrower, glabrous. *Anthers* with obcordate connective narrowed to the long slender filaments. *Follicles* with a slender curved beak.

Perak. Scortechini, No. 90*b*.

This species has as yet been collected only by the late Revd. Father Scortechini, whose specimens are moreover scanty, and none of them are in fruit.

PLATE 129. *Tetracera grandis*, King. 1, leaf; 2, inflorescence: *of natural size;* 3, flower with the petals removed: *slightly enlarged;* 4, flower, dissected; 5, anther; 6, two pistils: *much enlarged.*

PLATE 130.

WORMIA MELIOSMÆFOLIA, King in Journ. As. Soc. Bengal, for 1889, *pt.* 2, *p.* 365.
Nat. Ord. Dilleniaceæ.

A small tree, the young parts and leaf-petioles softly fulvous-tomentose. *Leaves* crowded near the apices of the branches, coriaceous, obovate-lanceolate to obovate-elliptic,

acute or acuminate, entire or minutely and remotely serrate, base acute, glabrous or glaberulous above except the 14 to 18 pairs of bold spreading pubescent nerves, under surface minutely tomentose; length of blade 5 to 10 in.; breadth 3 to 4 in., petiole about 1 in. *Flowers* about 3 in. in diam., axillary, solitary, on slender tomentose peduncles 1 to 2 in. long, or in few-flowered, linear-bracteolate pedunculate racemes. *Sepals* 5, ovate-oblong, velvety-tomentose externally, glabrous internally. *Petals* 5, obovate, pale yellow, veined, wavy. *Stamens* indefinite, in several series nearly free; anthers linear, erect, opening by apical pores. *Pistils* about 12, with linear recurved stigmas, ovules numerous. *Follicles* with several compressed arillate seeds. *Dillenia meliosmæfolia*, Hook. fil. & Th. Fl. Br. Ind. I, 36.

Malacca, Perak.

Originally described as a *Dillenia* by Sir Joseph Hooker who had not seen the fruit.

PLATE 130. *Wormia meliosmæfolia*, King. 1, branch with solitary flower just opening; 2, branch with racemose flowers just opening; 3, fully expanded flower dissected; 4, flower after the petals have fallen off, showing the accrescent sepals; 5, ripe follicles: *of natural size;* 6, anther: *enlarged.*

PLATE 131.

COCCULUS KUNSTLERI, King in Journ. As. Soc. Bengal, for 1889, *pt.* 2, *p.* 28.

Nat. Ord. Menispermaceæ.

A glabrous climber. Young branches striate, pale. *Leaves* membranous, with long petioles, peltate, rotund, acute; nerves 9, radiating from the petiolar insertion, thin but prominent on the pale under surface; length of blade 3·25 to 4 in., breadth about 3 in., or less; petiole slender, terete, not dilated at the base, about 3 in. long. *Panicles* racemoid, in fascicles of 2 to 4 from flat warty tubercles on the stem, narrow, the lateral branches only about ·5 in. long, few-flowered. *Sepals* 6, 2-seriate, the outer smaller. *Petals* 6, rhomboid, smaller than the sepals. *Male flower;* stamens 6, each embraced by a petal; filaments free, clavate; anthers broad, 4-celled. *Female flower;* staminodes 6 or 0. *Ripe drupes* 1 to 1·25 in. long, and about ·7 in. broad, narrowly sub-obovoid, compressed; pericarp of a thin pulp; endocarp horny, narrowly horse-shoe-shaped, the edge boldly ridged, the sides with deep radiating grooves and the central part with a deep vertical hollow; embryo sausage-shaped, bent along the circumferential chamber of the endocarp.

Perak, Ulu Bubong; King's collector, Nos. 4417 and 10282.

This has the flower of *Cocculus*, but the fruit of *Stephania*. It comes nearest to the Indian *C. macrocarpus*, which has a similar though smaller fruit, and, like that species, would belong to Mier's genus *Diploclisia*. It must be near *D. pictinervis* of that author.

PLATE 131. *Cocculus Kunstleri*, King. 1, branch with leaves; 2, raceme-like panicles of male-flowers removed from the stem; 3, panicles with ripe fruit also from the stem; 4 and 5, seeds: *of natural size;* 6, male flower dissected, the six sepals being detached; 7, anther embraced by a petal; 8 anther: *enlarged.*

PLATE 132.

CYCLEA ELEGANS, King in Journ. As. Soc. Bengal, for 1889, *pt.* 2, *p.* 387.

Nat. Ord. Menispermaceæ.

Scandent; young branches spirally striate, puberulous, as are the petioles and panicles; otherwise glabrous. *Leaves* slightly peltate, membranous, shining on both

surfaces, the reticulations minute, distinct, ovate to ovate-oblong, sh rtly acuminate the base rounded or cordate, 7-nerved (4 of the nerves minute); length of blade 3 to 4 in., breadth 1·5 to 2 in., petiole about 1 in. *Male* and *female panicles* sub-equal, slender, solitary, axillary, shorter than the leaves. *Male flowers* crowded, minute; *sepals* 4, connate into an inflated 4-lobed calyx. *Petals* 4, more or less connate into a 4-lobed corolla. *Anthers* 4, connate, crowning the staminal column, bursting transversely. *Female flower*: *sepal* 1, oblong. *Petal* 1, orbicular. *Ovary* 1; style short, 3-to 5-lobed, lobes radiating. *Drupe* pisiform, slightly compressed, style-scar subbasal; *endocarp* horse-shoe-shaped, dorsally tubercled, sides convex, 2-locellate, pulp thin. *Seed* curved; cotyledons slender, ½-terete, appressed.

Perak; at elevations of from 1,500 to 2,000 feet; King's collector, Scortechini. A slender creeper 15 to 25 feet long: not common.

PLATE 132. *Cyclea elegans*, King. 1, flowering branch: *of natural size*; 2, section of seed; 3 and 4, embryo; 5 and 6, male flowers; 7, staminal column; 8, anthers: *enlarged*.

PLATE 133A.

CLEOME HULLETTII, King in Journ. As. Soc. Bengal, for 1889, *pt.* 2, *p.* 392.

Nat. Ord. Capparideæ.

A much-branched, sub-decumbent, small shrub; the stem striate, puberulous, and with a few short prickles in distant pairs. *Leaves* dimorphous; those of the lower part of the stem petiolate, trifoliolate, the leaflets obovate; those of the upper part simple, sessile, ovate; all pubescent and from ·5 to ·75 in. long. *Flowers* solitary, axillary, about ·5 in. in diam., on slender pedicels longer than the leaves. *Sepals* 4, ovate, spreading, much smaller than the petals. *Petals* 4, rotund, narrowly clawed. *Stamens* 6, the filaments longer than the anthers. *Ovary* sessile, oblong, style 0. *Capsules* terete, striate, glabrous, from 1 to 1·5 in. long; seeds large, muricate, the embryo curved.

Singapore, in dry place by roadsides.

This is allied to the Peninnsular Indian species *C. aspera*, Koen, and *C. Burmanni*, W. & A. but differs from both in its dimorphous leaves.

PLATE 133A. *Cleome Hullettii*, King. 1, branch in flower and fruit; 2, ripe capsule dehiscing: *of natural size*; 3, flower dissected; 4, seeds: *enlarged*.

CAPPARIS, Linn.

Trees or shrubs, erect, decumbent or climbing, unarmed, or with stipular thorns. *Leaves* simple, rarely 0. *Flowers* white or coloured, often handsome. *Sepals* 4, free, imbricate in 2 series, or 2 outer subvalvate. *Petals* 4, sessile, imbricate. *Stamens* indefinite, inserted on the torus at the base of the long gynophore. *Ovary* stalked, 1 to 4-celled; stigma sessile; ovules many, on 2 to 6 parietal placentas. *Fruit* fleshy, rarely bursting by valves. *Seeds* many, imbedded in pulp, testa crustaceous or coriaceous; cotyledons convolute.

PLATE 133B.

CAPPARIS GALLATLYI, King n. sp.

Glabrous, young branches terete, unarmed. *Leaves* membranous, oblong or elliptic-oblong, shortly acuminate, entire, the base cuneate; length 6 to 7·5 in., breadth 2 to 2·5 in., petiole ·25 to ·35 in. *Racemes* terminal, solitary 5 to 7·5 in. long, puberulous, with a few scattered subulate bracteoles, many-flowered. *Flowers* ·25 in. in diam., on slender puberulous pedicels ·4 in. long. *Sepals* 4, ovate, blunt, concave, pubescent. *Petals* slightly longer than the sepals, ovate-lanceolate, acute, veined, glabrous. *Stamens* 16; the anthers elliptic-oblong, about one fifth of the length of the filaments. *Ovary* ovoid, acute, about one-fourth the length of the gynophore, which is slightly shorter than the filaments, multi-ovulate. *Fruit* unknown.

Burmah: Moolar plain, G. Gallatly.

PLATE 133B. *Capparis Gallatlyi*, King. 1, flowering branch: *of natural size*; 2, flower; 3, the same with the stamens removed; 4, stamens: *enlarged*.

PLATE 134.

CAPPARIS LARUTENSIS, King in Journ. As. Soc. Bengal, for 1889, *pt.* 2, *p.* 393.

Scandent, the young branches and petioles densely covered with minute, rusty, sub-deciduous, tomentum. *Stem* sub-striate; prickles in pairs, short, hooked. *Leaves* glabrous, coriaceous, oblong-lanceolate, obtuse or retuse, the midrib prominent, the 5 or 6 pairs of nerves obscure; length 1 to 1·25 in., breadth ·4 in., petiole ·2 in. *Flower pedicels* solitary, glabrous, more than half as long as the leaves. *Flowers* ·75 in. in diam., white to pink. *Sepals* 4, free, in two series, decussate, ovate-rotund, concave. *Petals* 4, sessile, imbricate, obovate-oblong, obtuse, puberulous. *Stamens* about 30, inserted on the torus at the base of the gynophore. *Gynophore* slender, 1·5 in. long. *Ovary* ovoid, globular, apiculate, many-ovuled. *Fruit* globose with an apical beak, ·6 in. in diam. (unripe). Seeds several, imbedded in pulp, testa crustaceous, cotyledons convolute.

Perak, at Larut; King's Collector, No. 5103.

A woody climber, 30 to 40 feet long. The petals change from white to pink. Ripe fruit is unknown. This must be near *C erythrodasys*, Miq.

PLATE 134. *Capparis Larutensis*, King. 1, flowering branch; 2, branch with young fruit: *of natural size*; 3, flower dissected; 4, stamens; 5, disk gynophore and ovary: *enlarged*.

PLATE 135.

CAPPARIS SCORTECHINII, King in Journ. As. Soc. Bengal, for 1878, *pt.* 2, *p.* 394.

Scandent; young parts, and the inflorescence at all stages densely and minutely ferrugineous-tomentose; older branches with 1 or 2 striæ, glabrescent; thorns stipular, in pairs, much shorter than the petioles, hooked. *Leaves* coriaceous, broadly lanceolate, acuminate, much narrowed at the base, glabrous above and the nerves obsolete; under surface ferruginous-tomentose when young, but becoming glabrescent, the midrib

and 6 pairs of nerves bold and prominent; length 5 to 8 in., breadth 2 to 3 in., (much smaller towards the end of the branches), petiole ·5 in. *Flowers* 1·5 in. in diam., on short lateral, leafly, bracteate, woody racemes. *Bracts* petiolate, ovate-acuminate, ·75 in. long, deciduous. *Sepals* 4, free, imbricate in 2 series, sub-rotund, concave, the outer pair tomentose externally. *Petals* pink, nerved, broadly obovate-elliptic, obtuse, the base cuneate, glabrous. Stamens about 50, inserted on the torus at the base of the long gynophore: *ovary* ovoid, blunt, stigma sessile; ovules numerous, on parietal placentas. *Fruit* globose, 3·5 to 4 in. in diam., the gynophore stout, transversely wrinkled, 2·5 in. long and ·6 in. in diam. *Seeds* compressed, ovoid, ·8 in long.

Batang Padang district in Perak. King's Collector No. 8033; Scortechini, 191.

The fruit of this has been only once collected. The species is a fine creeper, 15 to 20 feet long. It closely resembles *C. trinervia*, H. f. & Th. in many respects: but the leaves are not triple—but pinnate-nerved.

PLATE 135. *Capparis Scortechinii*, King. 1, flowering branch; 2, leaf from the lower part of the stem; 3, bract; 4, ripe fruit; 5, seed; 6, outer sepal; 7, petal: *of natural size*; 8 stamens: *enlarged*.

PLATE 136.

CAPPARIS CUCURBITINA, King in Jour. As. Soc. Bengal, for 1889, *pt.* 2, *p.* 395.

Scandent; branchlets finely striate, nearly glabrous; the thorns stipular, in pairs, hooked, very sharp, much shorter than the petiole. *Leaves* glabrous, shining, more or less broadly lanceolate or oblong-lanceolate, shortly acuminate, the base narrowed or rounded; main nerves 8 or 9 pairs, anastomosing in bold intramarginal arches, the secondary nerves bold as is the midrib, the reticulations distinct; length 5·5 to 7·5 in., breadth 1·75 to 2·25 in.; petiole under ·5 in., slender. *Flowers* in fascicles of 2 or 3, supra-axillary; the pedicils slender, more than 1 in. long, ebracteolate. *Sepals* ovate-lanceolate, acuminate, puberulous. *Petals* broadly elliptic, obtuse. *Stamens* about 20, the filaments unequal. *Ovary* on a short gynophore, narrowly elliptic, the stigma sessile, ovules numerous. *Fruit* cylindric, tapering to each end, the apex shortly beaked; when ripe orange-coloured, 3 in. long, and 1·5 in. in diam.; gynophore nearly ·75 in., pedicel 1·25 in., slender. *Seeds* ovoid, smooth, ·4 in. long.

Ulu Bubong, Perak. King's Collector, Nos. 10027 and 10795.

A creeper, 20 to 30 feet long; allied to *C. Finlaysoniana*, Wall. by its curious cucumber-like fruit, but with different leaves. Flowers have as yet been collected only in bud. Fully-developed flowers are still unknown.

PLATE 136. *Capparis cucurbitina*, King. 1, flowering branch with young leaves; 2, an adult leaf; 3, fruiting branch; 4, section of ripe fruit; 5, seeds: *of natural size*; 6, flower dissected; 7, anthers; 8, ovary; 9, section of ovary: *enlarged*. (*The drawings of the flower and its parts are all taken from buds—fully-developed flowers being as yet unknown.*)

PLATE 137.

CAPPARIS ANDAMANICA, King n. sp.

Glabrous, scandent; the branches finely striate, unarmed. *Leaves* coriaceous, shining, oblong or narrowly elliptic, acute, the base rounded, the edges slightly recurved when dry, midrib prominent, the 9—12 pairs of nerves very obscure; length of blade 3 to 4 in., breadth 1·25 to 1·5 in., petiole ·3 in. *Panicles* solitary, spreading, axillary,

shorter than the leaves. *Flowers* under ·5 in. in diam., crowded at the extremities of the branchlets. *Sepals* ovate-rotund, concave, glabrous. *Petals* very thin, elliptic, obtuse. *Stamens* 8, the filaments equal. *Gynophore* shorter than the filaments; ovary conical. *Fruit* globular, slightly narrowed to the base, 1 in. in diam., glabrous, with 6 to 8 seeds immersed in scanty pulp.

South Andaman Island, near the beach; Kurz, King's Collector.

A species allied to *C. Luzoniensis*, Turcz. Bull. Soc. Mosc., 1854, II, p. 324.

PLATE 137. *Capparis Andamanica*, King. 1, flowering specimen; 2, ripe fruit; 3, section of ripe fruit: *of natural size;* 4, flower; 5, the same dissected; 6, anthers; 7, pistil: *enlarged.*

PLATE 138.

CAPPARIS AMBIGUA, Kurz For. Flora Burmah, I, 65.

A large scandent shrub, the older branches armed with short sharp recurved thorns, the young parts puberulous. *Leaves* membranous, variable, broadly lanceolate to elliptic-oblong, obtuse or shortly acuminate, the base rounded, both surfaces glabrous; main nerves 8 to 12 pairs, spreading, indistinct; length 3 to 5 in., breadth 1·3 to 1·8 in., petiole ·3 in. *Panicles* terminal, lax, the flowers umbellulate on the ultimate branches. *Sepals* 4, concave, distichous; the outer pair orbicular, very concave; the inner pair rotund, smaller and, thinner than the outer and less concave. *Petals* 3 or 4, smaller than the sepals, obovate. thinner than the sepals. *Stamens* about 30: anthers ovate, much shorter than the filaments. *Gynophore* less than half as long as the filaments; ovary narrowly ovoid, acute, many ovuled. *Berry* elliptic, the apex shortly beaked, the base slightly narrowed, about ·7 in long, pulp scanty. *Seed* solitary, beaked.

South Andaman Island; Kurz, King's Collectors.

A species remarkable in the genus for its one-seeded fruit.

PLATE 138. *Capparis ambigua*, Kurz 1, flowering branch; 2, branch with ripe fruit; 3, section of ripe fruit; 4, seed: *of natural size;* 5, flower dissected (s-sepals, p-petals); 6, anthers: *enlarged.*

ROYDSIA, *Roxb.*

Nat. Ord. Capparideæ.

Large unarmed woody climbers, branches spotted white. *Leaves* simple. *Flowers* yellow, racemed or panicled. *Calyx* 6-partite, segments 2-seriate, tips slightly imbricate. *Petals* 0. *Stamens* indefinite, inserted above the base of the short cylindric gynophore. *Ovary* ovoid, 3-celled from the prolongation of the placentas; styles 3, subulate, or single and undivided; stigmas small, terminal; ovules many, 2-seriate in the angles of the cells. *Fruit* fleshy, with a woody 3-valved 1-celled endocarp, 1-seeded. *Seed* erect, cotyledons fleshy, unequal, longitudinally folded, the larger embracing the smaller.

PLATE 139.

ROYDSIA SCORTECHINII, King in Journ. As. Soc. Bengal, for 1889, *pt.* 2, *p.* 397.

Nat. Ord. Capparideæ.

Scandent, glabrous, except the minutely pubescent inflorescence and sepals. *Leaves* membranous, elliptic or obovate-elliptic, shortly and abruptly acuminate, narrowed to

the base; upper surface shining; the lower paler, the midrib and 6 pairs of arching main nerves prominent: length of blade 3·5 to 6·5 in., breadth 2 to 3 in; petiole ·75 to 1·25 in., thickened in the upper half and bent in the middle. *Flowers* in terminal or axillary panicles or racemes, shortly pedicellate, ·25 in. in diam. *Sepals* 6, slightly imbricate in bud, united at their bases, linear-oblong, sub-acute, minutely tomentose on both surfaces, reflexed. *Stamens* 30; the filaments unequal, slender, compressed, united by their bases, anthers innate. *Pistil* as long as the stamens, the gynophore shorter than the ovary, puberulous. *Ovary* ovoid, 3-celled, ovules many, glabrous. *Style* twice as long as the ovary, cylindric; stigmas 3, sessile, ovate, small. *Ripe fruit* ovoid, smooth, yellow, 1·5 in. long and 1 in. in diam., endocarp membranous. *Seed* erect, the cotyledons fleshy.

Perak; Scortechini, King's Collector, Nos. 8464 and 4225: in open rocky places from 500 to 1,200 feet.

In his field note on No. 8464, the collector describes this as "a splendid creeper 80 to 100 feet long;" in that on No. 4225, he says, "a tree 40 to 50 feet high." Fr. Scortechini's specimens have no notes. From the flexuose appearance of the dried twigs, I believe this is a creeper, and not a tree. This and the last belong to the section of *Roydsia* characterised by having an undivided style, for which Sir J. D. Hooker (F. B. I. i. 409), proposes the sectional name of *Alytostylis*, but with an expression of doubt as to whether it should not be separated off as a genus. To this group belongs also the Philippine species *R. floribunda*, Planch.

PLATE 139. *Roydsia Scortechinii*, King. 1, flowering branch; 2, fruiting branch: *of natural size*; 3, flower seen from below; 4, flower seen from above; 5, flower dissected, 6, anthers: *enlarged*.

PLATE 140A.

ROYDSIA FASCICULATA, *King n. sp.*

Nat. Ord. Capparideæ.

Young branches under surfaces of leaves and the inflorescence softly fulvous-puberulous, the older branches glabrous and lenticellate. *Leaves* membranous, broadly oblanceolate, abruptly and shortly acuminate, narrowed at the base; upper surface glabrous except the pubescent midrib, the lower sparsely pubescent, the midrib and 7 to 9 pairs of sub-horizontal nerves prominent; length of blade 3 to 4·5 in., breadth 1·25 to 1·75 in., petiole ·7 in., straight. *Racemes* 3—4 in. long, in fascicles of 2—3, axillary or from the axils of fallen leaves. *Flowers* shortly pedicellate, ·25 in. in diam. *Sepals* 6, oblanceolate, not united at their bases, velvetty-tomentose on both surfaces. *Stamens* about 35, the filaments flat, united near their sparsely hairy bases; anthers linear-oblong, innate. *Pistil* slightly longer than the stamens; gynophore ovary and style about equal in length, the two former densely tomentose; the style undivided, sub-glabrous; stigmas minute, ovary 3-celled.

Banks of Youngaleen River in Burmah; G. Gallatly, No. 499.

Described by Mr. Gallatly as a shrub. Collected only once, and not in fruit. This belongs to Hooker's sub-genus *Alytostylis*, another species of which (viz., *R. parviflora*, Griff.) is also a Burmese plant. But the latter is very distinct from this.

PLATE 140A. *Roydsia fasciculata*, King. 1, flowering branch: *of natural size*; 2, flower; 3, the same dissected; 4, anthers; 5, pistil; 6, section of the same: *enlarged*.

ALSODEIA, Thouars.

Nat. Ord. Violarieæ.

Trees or shrubs. *Leaves* alternate (rarely opposite), distichous; secondary nerves often numerous and parallel. *Stipules* rigid. *Flowers* small, axillary or terminal, solitary, fascicled, cymose or racemose, regular; peduncles with many bracts. *Sepals* 5, subequal, rigid. *Petals* 5, subequal, sessile. *Stamens* 5, inserted inside or upon an annular disk; with long or short often broad dorsal membranous connectival appendages, the cells of the anthers sometimes with apical linear processes. *Ovary* ovoid, style straight, stigma terminal, ovules few or many. *Capsule* 3-valved, few-seeded. *Seeds* glabrous in the Indo-Malayan species.—Distrib. Species about 50, chiefly tropical American.

Sect. I. PROSTHESIA Bl. (genus). *Anthers with a subulate appendage from the apex of each cell, and a broad (usually dorsal) appendage from the connective.*

PLATE 140B.

ALSODEIA MEMBRANACEA, King in Journ. As. Soc. Bengal, for 1889, *pt.* 2, *p.* 402.

A tree or shrub, the young branches shortly pubescent or tomentose. *Leaves* thin when dry, obliquely obovate-elliptic, shortly and rather abruptly acuminate, serrate, the base narrowed, rather unequal-sided, both surfaces glabrous, except the midrib and 6 to 8 pairs of pubescent arching nerves, the reticulations wide; length 5 to 7 in., breadth 2·5 to 3 in., petiole pubescent, ·5 in. long; stipules subulate, pubescent, ·2 in. long. *Racemes* axillary, condensed, sessile, shorter than the petioles, few-flowered. *Sepals* 5, unequal, the outer 3 rather larger than the inner, all broadly ovate-obtuse, pubescent externally. *Petals* 5, smaller than the sepals, ovate-oblong, sub-acute, the margins ciliolate with a few adpressed hairs on the back. *Stamens* 5, glabrous, the filaments very short, rising from a fleshy 5-lobed disc. *Anthers* broadly cordate or sub-reniform, with 2 very small subulate processes from the apices of the cells and a large dorsal, cordate-acuminate, brown, membranous appendage (from the connective) as wide as the anther. *Ovary* sessile, ovoid, villose; style cylindric, glabrous, stigma cup-shaped. *Capsule* globular, glabrous, the valves in dehiscence blunt: seeds sub-globular with a beaked caruncle.

Perak, at low elevations. King's Collector, Scortechini.

A shrub or small tree. This comes near *A. dasycaula*, Miq. in externals; but has fewer-nerved more glabrous leaves.

PLATE 140B. *Alsodeia membranacea*, King. 1, branch with flower and fruit; 2, capsule dehiscing; 3, seeds: *of natural size*; 4, flower bud; 5, flower seen from below; 6, flower seen from above; 7, flower dissected; 8, anther seen from behind; 9, anther from the front: *enlarged*.

NOTE.—*The specimen here figured has only young leaves: adult leaves are considerably larger.*

PLATE 141.

ALSODEIA KUNSTLERIANA, King in Journ. As. Soc. Bengal, for 1889, *pt.* 2, *p.* 401.

A glabrous shrub or small tree; the branchlets striate, sometimes lenticellate. *Leaves* subcoriaceous, oblong-lanceolate, acuminate or caudate-acuminate, sometimes minutely

and obscurely serrulate, very much narrowed to the base; upper surface smooth and shining; lower dull, rough from the numerous short transverse secondary nerves and 14 to 16 pairs of prominent ascending main nerves; the midrib bold and subrugose; the reticulations minute and distinct; length of blade 6 to 10 in., breadth 2·25 to 3 in., petiole ·25 to ·5 in. *Stipules* lanceolate, ·25 in. long. *Flowers* in axillary, often crowded, fascicles or very short racemes of 3 to 8, bracteolate, the pedicels shorter than the leaf-petioles. *Sepals* ovate, obtuse, imbricate, shorter than the petals, strongly nerved, the edges ciliate. *Petals* erect, the tips not reflexed, ovate-acute, rigid, the edges ciliate. *Stamens* with short flat filaments, each inserted into the apex of a lobe of the deeply 5-lobed disc. *Anthers* broad, adpressed to the ovary, each with 2 linear anterior appendages from the cells and one large dorsally-attached halbert-shaped membranous posterior appendage from the connective, the latter appendages conniving into a cone round the upper part of the ovary. *Ovary* sessile, ovoid-conic; the style exserted, cylindric. *Capsules* ovoid, glabrous, shining, smooth, ·5 in. long, dehiscing into three narrow compressed pointed valves; *seeds* one in each valve, ovoid, white, shining.

Singapore; Wallich, King's Collector. Perak; Scortechini, King's Collector; at low elevations.

There are two kinds of flowers in this plant—(*a*) those with pedicels as long as the flower; (*b*) those with pedicels shorter than the flower. In the former the anthers are perfect, and the ovaries produce seed. The flowers are thus truly hermaphrodite. In the latter the anthers have no pollen, but the ovaries are fruitful: they are virtually unisexual. The species is allied to *A. Wallichiana*, but differs from that species in its much more acuminate rougher leaves and also in its capsules and seeds.

PLATE 141. *Alsodeia Kunstleriana*, King. 1, branch with short-stalked flowers; 2, fascicles of long-stalked flowers; 3, ripe capsules: *of natural size*; 4, long-stalked flower; 5, the same dissected; 6, stamens of the same; 7, back view of a single anther; 8, front view of the same; 9, section of ovary of the same: 10, short-stalked flowers; 11, anthers of short-stalked flower: *all enlarged*.

PLATE 142A.

ALSODEIA HOOKERIANA, King in Journ. As. Soc. Bengal, for 1889, *pt.* 2, *p.* 402.

A small glabrous tree, the branchlets lenticellate. *Leaves* membranous, shining, shortly petiolate, elongate-oblanceolate or lanceolate, apex shortly and rather bluntly acuminate, entire or remotely serrulate, gradually narrowed below the middle to the base; nerves 7 to 9 pairs, arching, slightly prominent; length 4 to 8 in., breadth 1·25 to 2 in., petiole ·15 to ·25 in.; stipules ovate, only ·1 in.; long. *Racemes* axillary, and on the older branches from the axils of fallen leaves, numerous, rather dense when young, afterwards sparse and open, from ·75 to 1·5 in. long, bracteoles linear, deciduous, pedicels as long as or longer than the flowers. *Sepals* ovate, equal, pubescent or glabrous. *Petals* lanceolate with linear blunt apex, longer than the sepals, glabrous or pubescent along the midrib externally. *Stamens* glabrous, the filaments as long as the rather deep disc. *Anthers* broadly ovate, the base cordate, almost sub-reniform, the cells each with an apical point and with a broad membranous ovate acute dorsal appendage wider than the anther. *Ovary* sessile, pubescent; the style cylindric, glabrous; the stigma cup-shaped, truncate. *Capsule* globular, obtusely angled, glabrous, reticulate, ·8 in. long; the valves unequal, obtuse, compressed, sub-falcate: seeds sub-globose, pale, minutely mottled at the apex, the base with a papillate pitted caruncle.

Perak; at low elevations, Scortechini, Wray, King's Collector.

A tree from 20 to 30 feet in height; readily distinguished by its open, comparatively long, racemes. This closely resembles Blume's *Prothesia Javanica.*

PLATE 142A. *Alsodeia Hookeriana,* King. 1, flowering branch; 2, branch with flowers and fruits in various stages: *of natural size;* 3, flower seen from below; 4, flower seen from above; 5, flower dissected; 6, anthers and their disk; 7, anther, front view; 8, anther, back view; 9, ovary and style: *enlarged.*

PLATE 142B.

ALSODEIA WRAYI, King in Journ. As. Soc. Bengal, for 1889, *pt.* 2, *p.* 403.

A sub-glabrous shrub, the branchlets with pale brown puberulous bark, rarely lenticellate. *Leaves* membranous, glabrous, shining, shortly petiolate, oblanceolate, shortly acuminate, distinctly serrulate, narrowed to the base, length 3·5 to 4·5, rarely 6 to 7 in., breadth 1 to 2 in., petiole ·1 to ·2 in.; stipules linear, only ·1 in. long. *Racemes* very short, crowded, axillary or extra axillary, ·25 in. long; bracteoles broadly ovate, pubescent. *Sepals* lanceolate, tomentose externally. *Petals* oblong, obtuse, thickened and tomentose along the midrib. *Stamens* from the inside of a disc which is as deep as the filaments are long. *Anther* ovate-cordate, with a dorsal, broadly ovate-acute, membranous appendage as broad as itself, and a terminal apical process from each cell. *Ovary* sessile, densely villous as is the base of the cylindric style; stigma sub-capitate. *Capsule* minutely fulvous-velvetty when young, glabrous when old, globular-obovoid with obtuse angles, 1·2 in. or more long and 1 in. in diam.; the valves in dehiscence compressed, blunt. *Seeds* ovoid, brown, mottled, with sub-apical papillate pitted caruncle.

Perak, at low elevations; Scortechini, Wray, King's Collector.

A shrub 8 to 10 feet high. In respect of leaves very like *A. Hookeriana,* but smaller. The very short racemes, more hairy flowers and larger velvetty capsules distinguish it, however, from that species.

PLATE 142B. *Alsodeia Wrayi,* King. 1, flowering branch; 2, ripe fruit; 3, section of ripe fruit; 4, seeds: *of natural size;* 5, flower dissected; 6, anthers and pistil; 7, front view of anther; 8 back view of anther; *enlarged.*

PLATE 143A.

ALSODEIA CINEREA, King in Journ. As. Soc. Bengal, for 1889, *pt.* 2, *p.* 403.

A glabrous shrub or small tree, the branchlets whitish, sparsely lenticellate. *Leaves* membranous, elliptic-ovate or lanceolate, sometimes oblanceolate, acuminate, narrowed at the base, serrulate, pale when dry; nerves 8 to 10 pairs, slightly prominent below; length 4 to 6 in., breadth 1·5 to 2·5 in., petiole ·2 to ·4 in.; stipules scarious, pale, ovate-acute, striate, puberulous, ·25 in. long, deciduous. *Racemes* terminal, 2 to 6 in. long, bearing numerous 2-to 5-flowered cymules; bracts broadly ovate, scarious, concave, striate. *Sepals* broadly ovate, ciliolate. *Petals* oblong, obtuse, the apex undulate erose or toothed, edges ciliolate. *Stamens* from the edge of a fleshy disc; filaments very short, glabrous; anthers ovate, pilose near the base, with a broadly ovate appendage from the middle of the back curving over the apex, the cells divergent at the apex and each with a subulate terminal appendage. *Ovary* sessile, glabrous, globose, grooved: Style cylindric, with a few white adpressed hairs; stigma obliquely truncate, cup-shaped.

Capsules obovoid, bluntly angled, glabrous, reticulate, ·75 in. long, their valves blunt; seeds globose with an ovoid beaked hilum, pale, smooth.

Perak, at low elevations, King's Collector.

Var. *hirsutiflora*, King. *Sepals* tomentose externally, filaments sparsely villous, disc small; the cymules larger and the bracteoles longer and narrower than in the typical form.

Perak; Changkat Jerin. L. Wray, junior.

The whole plant when dried has a characteristic grey colour, and from this circumstance I have given its specific name.

PLATE 143A. *Alsodeia cinerea*, King. 1, flowering branch; 2, fruits; 3, fruits dehiscing; 4 and 5, seeds: *of natural size*; 6, flower dissected; 7, anther, front view; 8, anther, back view; 9, ovary and style: *enlarged*.

SECT. II. PENTALOBA. *Anthers with a broad, usually terminal, appendage from the connective; but none from the cells.*

PLATE 143B.

ALSODEIA FLORIBUNDA, King in Journ. As. Soc. Bengal, for 1889, *pt.* 2, *p.* 406.

A shrub or tree, the young branches minutely fulvous-tomentose. *Leaves* membranous, shortly petiolate, oblong-lanceolate, ovate-lanceolate, sometimes elliptic, acute or acuminate, more or less obscurely serrulate; the base rounded, rarely acute; upper surface glabrous except the pubescent midrib and nerves; under surface minutely and softly tomentose, the midrib and 14 to 16 pairs of rather straight nerves and the transverse secondary nerves prominent; length 4·5 to 7 in., breadth 1·5 to 2·5 in., petiole ·1 to ·2 in.; stipules lanceolate, pubescent on the midrib, ·25 in. long. *Cymes* axillary and terminal, on peduncles 1 to 1·5 in. long, much branched, dichotomous, spreading, many-flowered; bracteoles oblong, obtuse, pubescent. *Sepals* unequal, the outer 3 ovate-rotund, the inner 2 ovate, all obtuse and pubescent. *Petals* ovate-oblong, sub-acute, longer than the sepals, the apices usually reflexed. *Stamens* from a deep, puberulous, lobed disc; filaments expanded and pilose towards the apex, contracted and glabrous below; anthers elongate-ovate, with a single connectival ovate terminal appendage. *Ovary* sessile, villous-tomentose; style cylindric, puberulous; stigma truncate, cup-shaped. *Capsule* ovoid, obtusely angled, adpressed-pubescent, ·35 in. long, the valves blunt; seeds sub-globose, angled; caruncle long, narrow.

Perak, at low elevations; very common. Distrib. Sumatra; Lampongs, Forbes, 1719; Padang, Beccari, P. S. 683.

Usually a tree, and sometimes attaining the height (*fide* Kunstler) of 70 feet. But also, according to the same collector, found as a shrub 6 to 8 feet high. This is allied to the Burmese species *A. mollis* H. f. and Th., which, however, besides having the anthers of a *Prosthesia*, has much smaller cymes, and broader bracteoles and sepals.

PLATE 143B. *Alsodeia floribunda*, King. 1, flowering branch; 2, inflorescence with fruits in various stages: *of natural size*; 3, seed; 4, flower dissected; 5, stamens and their disc; 6 & 7, stamen, front and back views: *enlarged*.

PLATE 144.

ALSODEIA SCORTECHINII, King in Journ. As. Soc. Bengal, for 1889, *pt.* 2, *p.* 405.

A small glabrous tree, the branchlets usually pale brown. *Leaves* membranous, shortly petiolate, obliquely elliptic-lanceolate or oblanceolate, shortly and bluntly acuminate, irregularly serrulate; main nerves about 12 or 13 pairs, rather bold; secondary nerves transverse, slightly prominent below; length 7 to 9 in., breadth 2 to 3 in., petiole ·2 in. *Racemes* sessile, about ·5 in. long, several together, axillary or extra-axillary, about 3-to 5-flowered, with ovate bracteoles. *Flowers* pedicellate. *Sepals* puberulous, broadly ovate, much shorter than the petals. *Petals* 5, lanceolate, with long bluntly acuminate exserted apices. *Stamens* glabrous, shorter than the petals; the filaments twice as long as the anthers, slender, rising from a deep, 5-lobed, disc; the anthers short, ovate, with a single very small terminal appendage; ovary sessile, globose, glabrous, warted; style long, cylindric, glabrous or puberulous. *Ripe capsule* globular, pointed, rather more than ·5 in. long, glabrous, lenticellate; valves compressed, pointed. *Seeds* 2 in each valve, sub-rotund, whitish, caruneulate.

Perak; King's Collector, Scortechini, Wray; at low elevations.

A large shrub or tree 20 to 25 feet high. Externally this much resembles *A. Maingayi*, but the flowers, and especially the anthers, differ much.

PLATE 144. *Alsodeia Scortechini*, King. 1, flowering branch; 2, ripe fruits: *of natural size;* 3, seed; 4, flower dissected; 5, the stamens and their disc removed from the same; 6, stamens, back and front view: *enlarged.*

PLATE 145.

ALSODEIA CONDENSA, King in Journ. As. Soc. Bengal, for 1889, *pt.* 2, *p.* 405.

A glabrous tree; the older branchlets pale, lenticellate. *Leaves* membranous, shortly petiolate, inequilateral, elliptic to elliptic-oblong, sub-acute, sub-entire, gradually narrowed below the middle to the acute slightly unequal base; shining above, dull beneath and darker except the midrib and 13 to 15 pairs of prominent, sub-erect, pale main nerves; secondary nerves transverse; length 8 to 14 in., breadth 3 to 4·5 in., petiole ·25 to ·35 in.; stipules subulate, ·35 to ·5 in. *Panicles* axillary, crowded, much branched, spreading, 1 to 2·5 in. long (longer in fruit), puberulous or glabrescent; the bracteoles numerous, ovate, acute. *Sepals* unequal; the outer 2 or 3 larger, rotund; the inner 2 or 3 ovate, pubescent on the back. *Petals* ovate, a little longer than sepals, rhomboid, with pale edges, villous on the back externally and along the midrib internally. *Stamens* glabrous, the filaments rather short, from a fleshy disc; anther cordate, with a single terminal minute white ovate membranous appendage from the connective. *Ovary* sessile, globose, glabrous. Style cylindric, stigma cup-shaped. *Capsule* ovoid, pointed, glabrous, not lenticellate: valves compressed, pointed; seeds sub-globular, carunculate.

Perak, Scortechini, King's Collector; at low elevations.

A tree 30 to 40 feet high, approaching *A. Scortechini* in externals, but with different flowers.

PLATE 145. *Alsodeia condensa*, King. 1, flowering branch; 2, panicles with ripe fruit: *of natural size;* 3, seed; 4, flower, dissected; 5, anthers with their tube; 6, anthers, back and front view; 7, pistil: *enlarged.*

PLATE 146A.

ALSODEIA CAPILLATA, King in Journ. As. Soc. Bengal, for 1889, *pt.* 2, p. 407.

A small shrub, the young branches rufous-tomentose. *Leaves* membranous, shortly petiolate, lanceolate, acuminate, the edges serrulate, the base acute; upper surface glabrous except the pubescent nerves and midrib, lower rufous-pubescent; the nerves about 12 pairs, bold, as are the transverse veins; length 4 to 6 in., breadth 1·5 to 1·75 in., petiole ·2 in.; stipules lanceolate, pubescent externally. *Flowers* in small, sub-sessile, 3- to 5-flowered axillary cymes. *Sepals* narrowly oblong, obtuse, tomentose externally. *Petals* linear-oblong, the apex sub-acute and reflexed, hairy along the midrib externally. *Stamens* alternating with the lobes of a deep, 5-lobed, glabrous disc; filaments slender, glabrous, longer than the anthers. *Anthers* small, ovate, each with an ovate acute small terminal appendage. *Ovary* sessile, globular, villous; style long, cylindric, sub-villous; stigma truncate, cup-shaped. *Capsule* ·5 in. long, rusty-pubescent externally and densely covered with unbranched, often hooked, soft, pubescent spines about ·15 in. long and not felted. *Seeds* ovoid, smooth, pale, with dark semi-circumferential band, and an oblong carunculus.

Laroot in Perak, King's Collector, No. 2162. A small bush 4 to 8 feet high.

This comes near *A. echinocarpa* and *A comosa*, but differs notably in its flowers and seeds.

PLATE 146A. *Alsodeia capillata*, King. 1, flowering branch; 2, ripe fruit dehiscing: *of natural size*; 3, flower: *slightly enlarged*; 4, flower dissected; 5, flower with calyx and corolla removed; 6, two anthers with part of the disc (*one of the anthers turned round to show its back*); 7, ovary and style: *enlarged*.

PLATE 146B.

ALSODEIA COMOSA, King in Journ. As. Soc. Bengal, for 1889, *pt.* 2, *p.* 407.

A shrub or small tree, the young branches densely ferruginous-tomentose. *Leaves* membranous, sub-sessile, oblong-oblanceolate, caudate-acuminate, serrulate, the base narrowed; upper surface glabrous; the lower pubescent, especially on the prominent midrib and 14 to 16 pairs of lateral nerves; length 5·5 to 7·5 in., breadth 1·5 to 2·5 in., petiole ·2 in.; stipules subulate, ·3 in. long. *Flowers* in dense axillary bracteolate glomeruli. *Sepals* ovate, obtuse, tomentose. *Petals* lanceolate, acuminate, pubescent externally, and (like the sepals) with an apical tuft of hairs, glabrous internally. *Stamens* from a short minutely toothed glabrous disc, the filaments longer than the anthers: anthers narrowly ovate, each with a small rounded terminal appendage from the connective. *Ovary* elongate, sparsely villous; style pubescent; stigma truncate, cup-shaped. *Capsule* ·5 in. long flocculent-tomentose, densely covered with unbranched, subulate, soft, pubescent spines about ·5 in. long, not felted. *Seeds* pale, ovoid, smooth, with sub-terminal papillate caruncle.

Perak, Wray, Nos. 3299 and 1254; King's Collector, Nos. 406 and 554.

PLATE 146B. *Alsodeia comosa*, King. 1, flowering branch; 2, glomerule with flowers and young fruit; 3, ripe fruit dehiscing: *of natural size*; 4, seeds: *slightly enlarged*; 5, flower dissected; 6, anthers and disk; 7, anthers front and back; 8, pistil: *enlarged*.

HYDNOCARPUS, Gærtner.

Nat. Ord. Bixineæ.

Trees. *Leaves* alternate, serrate or entire, transverse veinlets numerous, stipules deciduous. *Flowers* solitary, or in irregular axillary few-flowered racemes or fascicles, monœcious or diœcious. *Sepals* 5, equal or unequal, imbricate in bud. *Petals* 5, with a scale opposite each. FL. ♂; *Stamens* 5—20; anthers reniform, connective broad. *Ovary* 0 or rudimentary. FL. ♀; *Stamens* as in the ♂ but without pollen, or reduced to staminodes. *Ovary* 1-celled; stigmas 3—6, sessile or subsessile, spreading, dilated, lobed; ovules many, on 3—6 parietal placentas. *Berry* globose, many-seeded, rind hard. *Seeds* many, imbedded in pulp; testa crustaceous, striate; albumen oily; cotyledons very broad, flat. Distrib. Species about 12, tropical Asiatic.

PLATE 147.

HYDNOCARPUS NANA, King in Journ. As. Soc. Bengal, for 1890, *pt.* 2, *p.* 118.

A shrub or small tree; the branches and young shoots glabrous or (var. *pubescens*) pubescent. *Leaves* subcoriaceous, from obovate-lanceolate to oblong-lanceolate, inequilateral, sub-falcate, shortly acuminate, remotely and minutely mucronate-serrulate, narrowed and unequal at the base, shining and glabrous except the midrib and nerves which, on both surfaces, are usually more or less pubescent; nerves 5 to 8 pairs, spreading or sub-erect, thin but prominent beneath; length 2·5 to 5 in., breadth ·75 to 2·5 in., petiole ·25 to ·35 in.; stipules persistent, linear-lanceolate, pubescent, about as long as the petioles. Male inflorescence small, supra-axillary, 1- to 4-branched, uniparous, tomentose, bracteolate, cymes not much longer than the petioles, flowers ·25 in. in diam. *Sepals* 5, rotund, the 3 external slightly imbricate, pubescent; the 2 inner much imbricate, glabrescent. *Petals* 5, smaller than the sepals, fleshy, with long white silky hairs externally, and each internally with a small oblong scale. *Filaments* short, thick, sericeous, the connective reniform; the anther cells small, remote from each other. Ovary 0. *Female flowers* solitary, supra-axillary, on glabrous pedicels ·5 in. long. *Sepals* and *petals* as in the male, stamens without pollen; ovary ovoid, tomentose; stigmas 3, large, flat, bifid, reflexed. Fruit on a pedicel ·5 in. long, solitary, axillary, depressed-globular, minutely rugose, and velvetty tawny-tomentose; about 1 in. in diam. or less; pericarp dry, thin. *Seeds* 3 or 4, plano-convex, ·5 in. long.

Penang, Curtis, No. 854: Perak; King's Collector, Scortechini, Wray.

This varies considerably as to size of leaf and fruit and in the amount of pubescence. In some specimens of the male plant the leaves towards the apices of the branches are much reduced in size. The form which has larger, more pubescent leaves may be separated as a variety, and farther acquaintance with it may prove that it is separable as a species.

PLATE 147. *Hydnocarpus nana*, King. 1, branch with male flowers; 2, ripe fruit; 3, section of the same; 4, seed: *of natural size*; 5, male flower seen from below; 6, male flower from above; 7, male flower, dissected; 8, stamens: *enlarged*.

PLATE 148.

HYDNOCARPUS CURTISII, King in Journ. As. Soc. Bengal, for 1890, *pt.* 62, *p.* 119.

A glabrous shrub or small tree. Young branches slender, pale brown when dry. *Leaves* coriaceous, shining on both surfaces, oblong-lanceolate, rarely ovate, slightly inequilateral, gradually narrowed to the acuminate apex; the base unequally narrowed, rarely rounded; nerves 9 to 11 pairs, thin, spreading; reticulations obscure on the upper surface; length 5 to 12 in., breadth 2·25 to 3 in.; petiole less than ·5 in. thick. *Male flowers* in small, axillary, branched, bracteolate, uniparous cymes, ·75 to 1 in. in diam.; pedicels scurfy-tomentose, ·75 in. long. *Sepals* reflexed, ovate, blunt, imbricate, pale, minutely pubescent, shorter than the petals. *Petals* 5, narrowly oblong, blunt, concave at the apex, ·65 in. long, glabrous; the gland nearly as long, linear, ciliate at the apex. *Anthers* 5, longer than the filaments, broadly ovate, cordate at the base. Ovary 0 or rudimentary. *Female flowers* on shorter, grooved, pedicels; ovary elongate-ovoid, tawny-tomentose; the stigmas 3, fleshy, bifid, spreading. *Fruit* on a stout pedicel nearly ·5 in. long, globose, with long apical papilla, minutely rugose and velvetty, vertically ridged, the stigmas persistent; nearly 1·5 in. long and 1 in. in diam. Seeds few, plano-convex, ·4 in. long.

Penang, Curtis, 800, 1534. Perak; King's Collector, Scortechini.

No specimen that I have seen has female flowers showing anything besides the ovary. Complete female flowers are much wanted.

PLATE 148. *Hydnocarpus Curtisii*, King. 1, flowering branch; 2, ripe fruit; 3, seed: *of natural size*; 4, flower dissected; 5, anthers, front and back view: *enlarged*.

PLATE 149.

HYDNOCARPUS CUCURBITINA, King in Journ. As. Soc. Bengal, for 1890, *pt.* 2, *p.* 120.

A tree 60 to 80 feet high; very young branches and leaves with minute ferruginous mealy tomentum; otherwise glabrous. *Leaves* thinly coriaceous, slightly inequilateral and contracted at the base on one side, eliptic-oblong, tapering to either end, the apex with a short rather blunt acumen, the edge very slightly recurved when dry; both surfaces, but especially the lower, shining and with the tranverse veins and minute reticulations very distinct; main nerves 5 to 6 pairs, sub-erect, thin; length 3·5 to 5 in., breadth 1·5 to 2·25 in., petiole ·25 in. *Cymes* diœcеous (the female flowers few), axillary, three times as long as the petioles, bracteolate, 3- to 6-branched. *Male flowers* about ·3 in. in diam. on pedicels ·4 in. long. *Sepals* broadly ovate, blunt, pubescent-tomentose externally. *Petals* ovate-rotund, glabrous, thin, each with a fleshy scale with white ciliate edges and nearly as long as itself, but not so broad. *Anthers* ovate-cordate, glabrous; the filaments short, conical: *Ovary* rudimentary, sericeous. *Female flowers* like the males, but on slightly shorter pedicels and with smaller barren stamens. *Ovary* cyclindric, densely sericeous-tomentose; *stigmas* elongate, fleshy, bifid at the apex, not reflexed when young. *Fruit* narrowly obovoid, cylindric, mamillate at the apex and contracted at the base; minutely tomentose, smooth, dark-brown when ripe and from 3 to 5 in. long; carpophore and pedicel about ·5 in. each, or more. *Seeds* one or two, obovoid, smooth, about 1 in. long.

Perak, up to elevations of 1,000 feet. Common.

Distinguished from every hitherto described species of this genus by its elongate cucumber-shaped fruit. The scales of the petals are also much larger and broader than is usual in *Hydnocarpus*.

PLATE 149. *Hydnocarpus cucurbitina*, King. 1, branch with male flowers; 2, ripe fruit; 3, seed: *of natural size;* 4, male flower dissected; 5, rudimentary pistil of male flower; 6, anthers of male flower; 7, ovary and styles from female flower after fertilisation, one of the stigmas having fallen off, and the after two having become deflexed: *enlarged.*

PLATE 150.

HYDNOCARPUS WRAYI, King in Journ. As. Soc. Bengal, for 1890, *pt.* 2, *p.* 121.

A small sub-glabrous tree. Young branches with pale brown, minutely lenticellate, puberulous bark. *Leaves* sub-coriaceous, elliptic, shortly and abruptly acuminate, the edge slightly recurved when dry; the base rounded, sometimes narrowed and unequal; the reticulations on both surfaces very prominent; upper surface glabrous, shining, minutely pustulate when dry; the lower of a pale brown when dry, glabrous except the puberulous midrib and 8 to 9 pairs of bold sub-erect nerves; length 8 to 10 in., breadth 3·5 to 4 in.; petiole less than ·5 in., stout. *Male flowers* nearly ·5 in. in diam., in very minute, axillary, pedicelled, few-flowered cymes. *Sepals* 5, slightly imbricate, rotund, pubescent, larger than the petals. *Petals* 5, of the same shape as the sepals, but smaller, each with a fleshy roughly cuneate scale the apex of which is irregularly toothed and ciliate. *Stamens* 15, the filaments glabrous, much thickened at the base; anthers broadly ovate, cordate. *Female flowers* unknown. *Fruit* narrowly ovoid, tapering at both ends, often 3 in. long. and 1·75 in. in diam., minutely fulvous-velvetty; the apical mamilla ·75 in. long with its top depressed and crowned by the 3 fleshy bifid stigmas; one-celled, several-seeded. *Pedicel* short, stout. *Seeds* embedded in a little pulp, elongate, plano-convex, ·75 in long.

Perak. King's Collector, No. 3800; Wray, No. 2608.

This species has more stamens than are usual in the genus *Hydnocarpus*. In this respect it appears to form a connecting link with *Taraktogenos*: but in shape the anthers do not agree with those of that genus.

PLATE 150. *Hydnocarpus Wrayi*, King. 1, leaf-twig; 2, ripe fruit; 3, section of ripe fruit; 4, seed: *of natural size;* 5, male flower; *slightly enlarged;* 6 & 7, sepals; 8, petal with its scale; 9, stamens of male flower; *enlarged;* 10, two stamens: *much enlarged.*

PLATE 151.

HYDNOCARPUS ILICIFOLIA, King, n. sp.

A small tree; the young branches pale, striate. *Leaves* coriaceous, oblong, acuminate, the edges remotely but sharply serrate, the base slightly cuneate; main nerves 7 pairs, curving, faint; the reticulations distinct; length 3·5 to 6 in., breadth 1·25 to 2·25 in., petiole ·3 in. *Male flowers* in few-flowered axillary fascicles, not much longer than the petioles, the buds depressed-globular, the pedicels very short. *Sepals* 4, in decussate pairs, very concave and much imbricate, rotund. *Petals* 4, sometimes 8, smaller than the sepals, erose, the gland large and sub-quadrate. *Stamens* 20; the anthers ovate, longer than the short, stout, pubescent filaments. *Female flowers* unknown. *Fruit*

globular, minutely rusty, velvetty-pubescent, 1·5 in. in diam., containing several sub-ovoid angled seeds.

Kedah: Curtis No. 2671. Langkani: Curtis No. 2603. Distrib. Java (Preanger Province), Forbes No. 1159.

I have seen no fully expanded male flowers of this and no female flowers. The species is, however, a very distinct one.

PLATE 151. *Hydnocarpus ilicifolia*, King. 1, branch with male flowers in bud; 2, ripe fruit; 3, seed: *of natural size;* 4, sepal; 5, petal with its scale; 6, stamens of a male bud seen from above: *enlarged*; 7, single stamen, front view: *much enlarged.*

TARAKTOGENOS, Hassk. *Nat. Ord. Bixineæ.*

Trees with entire alternate leaves and minute fugaceous stipules. *Flowers* in more or less dense, short, axillary, few-flowered cymes; a few hermaphrodite, but the majority staminiferous only. *Staminiferous flower; sepals* 4, in decussate pairs, much imbricate, rotund, concave: *petals* 8, in two rows, smaller than the sepals, imbricate, each with a gland at its base; glands less than half as large as the petals, fleshy, cuneate, plano-convex, ridged, the apex often irregularly toothed and with 2 or 3 cylindric pits. *Stamens* 20 to 32, the anthers deeply cordate. *Female flowers* like the males, but the sepals often only 3, the petals 6, and the stamens 16 or 17; *ovary* elongate-ovoid, sulcate, divided above into 4 oblong, divergent, reflexed lobes, each bearing a stigmatic surface internally; 1-celled with 4 multi-ovulate parietal placentas. *Fruit* large, globular or ovoid, with hard fibrous or woody rind, and several large seeds embedded in a scanty pulp. *Seeds* with thick hard testa, copious albumen, and straight central embryo; the cotyledons large, cordate, foliaceous, 3-nerved. Species probably about 8; all Malayan.

Note.—This genus was founded by Hasskarl (Retzia, i. 127) on the plant named *Hydnocarpus heterophyllus* by Blume (Rumphia, iv, 22, t. 178B., fig. 1, and Mus. Bot. i, 16). Until now that plant has been the only known species. But the following have been discovered by Messrs. Kunstler and Wray in Perak. And from the similarity in externals to *Hydnocarpus*, as well as from the imperfect nature of the Herbarium materials of the latter, it appears to me extremely probable that several things now referred to *Hydnocarpus* really belong to *Taraktogenos*. In the Calcutta Herbarium, there are imperfect materials of, at least, 8 undescribed species which belong either to one or other of these two genera.

PLATE 152.

TARAKTOGENOS KUNSTLERI, King in Journ. As. Soc. Bengal, for 1890, *pt.* 2, *p.* 122.

A sub-glabrous tree 40 to 60 feet high. Young branches fulvous-puberulous. *Leaves* coriaceous, unequal-sided, oblong-lanceolate to elliptic, shortly acuminate; the base narrowed and unequal, 3-nerved; both surfaces shining, the lower rough from the prominent nerves and reticulations; lateral nerves 3 to 5 pairs on the narrower and 4 to 7 pairs on the wider side, sub-erect, prominent beneath; length 4·5 to 6 in., breadth 1·5 to 3 in.; petiole ·3 to ·5 in., puberulous. *Cymes* dense, many-flowered. *Male flowers* ·5 to ·6 in. in diam.; their pedicels ·25 to ·35 in.; petals densely sericeous externally,

the scales half as long, their apices erose, glabrous. *Stamens* 24 to 32; the filaments short, subulate, sericeous; anthers elongate, deeply cordate. *Female flowers* like the males, but sepals 3, petals 6, and stamens about 17 only. *Ovary* ovoid, glabrous, deeply sulcate, with 4 radiating reflexed oblong stigmas, 1-celled, with 4 multi-ovulate parietal placentas. Fruit solitary, globular, smooth, 2·5 in. in diam.; the pericarp thick, the outer layer fibrous, the inner woody. *Seeds* embedded in scanty pulp, plano-convex, ·75 in. or more in length.

Perak; in dense forest at low elevations; King's collector, Nos. 6042 and 8183; Wray, 3389.

PLATE 152. *Taraktogenos Kunstleri*, King. 1, branch with male flowers; 2 ripe fruit: *of natural size;* 3, sepal; 4, petal; 5, staminal column; 6, stamens; 7 rudimentary ovary from male flower: *much enlarged.*

RYPAROSA (RYPARIA), Blume. *Nat. Ord. Bixineæ.*

Trees or shrubs with entire, alternate, elongate, petiolate leaves, finely reticulate and more or less glaucescent beneath. *Flowers* rather small, diœcious; the males in long axillary racemes; the females in shorter racemes, solitary, or in pairs. *Calyx* globose in bud, 3- to 5-cleft. *Petals* 5, imbricate, coriaceous; in the female flower each with a large sericeous scale at its base. *Male flower;* filaments united in a column with 5, ovate, 2-celled, extrorse anthers at its apex. *Female flower; staminodes* 5, alternate with the petals. *Ovary* 1-celled, with 1 to 3, biovulate, parietal placentas. *Stigmas* 2 to 3, sessile, broad, emarginate. *Fruit* baccate with little pulp; the pericarp coriaceous, tomentose. *Seeds* 1 or 2, sub-globular, smooth.

Note.—This genus was first published by Blume in his Bijdragen (p. 600) as *Ryparosa*, and in that work he published only the single species *R. cæsia*. In a footnote to the preface of his *Flora Javae* (p. viii), the same author referred to the genus (apparently by inadvertence) as *Ryparia* instead of *Ryparosa;* and the name *Ryparia* has been adopted by most subsequent authors. Blume regarded the genus as *Euphorbiaceous*, in which view he was followed by Endlicher (Gen. 5836), Hasskarl (Pl. Jav. Rar., p. 267), and Baillon (Etud. Euph., p. 339). Müll. Arg. (in DC. Prod. XV, ii., p. 1260) excluded the genus from *Euphorbiaceae*; and, in their *Genera Plantarum*, the late Mr. Bentham and Sir J. D. Hooker, (G. P. iii., 257), also exclude it; but, having seen no specimens either of it or of *Bergsmia*, they make no suggestion as to the true position of *Ryparosa* or of the relation of *Bergsmia* to it. Kurz (Journ. Bot. for 1873, p. 233, and For. Fl. Burm. I. 76) was the first to refer *Ryparosa* to *Bixineae*. But Kurz made the mistake of describing in the latter work, as "*Ryparia cæsia*," a plant which agrees neither with Blume's description nor with his specimens of *Ryparosa cæsia*. The name of Kurz's plant I have therefore altered to *R. Kurzii*. In 1848, Blume published, in Rumphia IV, p. 23, t. 178 C., fig. 2, a new genus called *Bergsmia* which, as Kurz also pointed out (Journ. of Bot. for 1873, p. 233), is nothing more or less than his older *Ryparosa*. Only one species (*B. javanica*) was known to Blume. To this Miquel added (Fl. Ind. Bat. Suppl. 389) two species, namely, *B. Sumatrana* and *B.? acuminata*. I have seen neither of these; but the cymose inflorescence of *B. Sumatrana* leads me to believe that it must be a *Hydnocarpus*, while the second (*B? acuminata*) was referred doubtfully to *Bergsmia* by its author himself. The collections brought, within the past year or two, from Perak by the collectors of the Calcutta garden contain copious suites of specimens of *Ryparosa* and, from an examination of these, I have no doubt that *Ryparosa* belongs to *Bixineae*, and that *Bergsmia* must be reduced to it. Besides the seven species described below, there are in the Calcutta Herbarium imperfect materials belonging to, several additional species from Perak, and to some from Sumatra. Wall. Cat. No. 7847B. (from Penang) and Beccari's No. 702 (from Sumatra), are also clearly species of *Ryparosa*.

PLATE 153.

RYPAROSA CÆSIA, Bl. Bijdr. 600; *Ryparia*, Fl. Javac (praef. VIII).

A small tree, the branchlets and inflorescence ferrugineous-silky. *Leaves* coriaceous, oblong or obovate, shortly acuminate, the base slightly narrowed; upper surface shining; lower pale, rather densely but minutely adpressed-sericeous; nerves 4 or 5 pairs, ascending; length 6 to 9 in.; breadth 2 to 3 in.; petiole ·75 to 1 in., stout, thickened in its upper fourth. *Racemes* solitary, supra-axillary, the female longer than the leaves. *Male flowers*; *sepals* 3, ovate, glabrous; *petals* 5, tomentose, with a basal hairy scale. *Staminal tube* short, glabrous; *anthers* 4, broadly ovate, reflexed. Pistil (in female flower only) with pubescent ovoid globose ovary. *Fruit* crowned by the 2 shortly-stalked fleshy radiating reniform emarginate stigmas, globose, ferruginous-tomentose, ·5 to ·7 in. diam. Hassk. Pl. Javan. Rar. 267: Baillon Euphorb. 339. Miq. Fl. Ind. Bat. i. pt. 2, p. 361. DC. Prod. XV, 2 p. 1260. Kurz in Journ. Bot. 1873, p. 233. King in Journ. As. Soc. Bengal for 1892, pt. II, p. 128.

Java, Blume. Sumatra; Teysmann, Forbes, at an elevation of 3,500 feet.

Blume describes the lower surfaces of the leaves as "tenuiter strigosis"; but the hairs, although adpressed, are not stiff but silky. This is the only species in which the hairs on the lower surface of the leaves are at all conspicuous. The leaves of the Andaman plant referred to *R. caesia* by Kurz are nearly glabrous beneath.

PLATE 153. *Ryparosa caesia*, Blume. 1, branch with inflorescence of male flowers; 2, branch with ripe fruit; 3, section of ripe fruit: *of natural size*; 4, male flower: *enlarged*; 5, sepal; 6, petal; 7, staminal column; 8, pistil (from female flower): *much enlarged*.

PLATE 154.

RYPAROSA KURZII, King in Journ. As. Soc. Bengal, for 1892, *pt.* 2, *p.* 125.

A tree or shrub. Young shoots adpressed ferruginous-puberulous. *Leaves* elliptic to elliptic-oblong, shortly and bluntly acuminate, the base slightly narrowed; upper surface shining, glabrous except the puberulous midrib; lower glaucous, the reticulations distinct; nerves 6 or 7 pairs, spreading, prominent beneath; length 8 to 12 in., breadth 4 to 5·5 in.; petiole 1·25 in., thickened in its upper fourth, pubescent. *Male racemes* 5 to 10 in. long, ferruginous-tomentose, the petals reflexed: *female racemes* shorter and subglabrous. *Fruit* globose, the size of a small cherry, lenticellate, 1—2-seeded. *R. cæsia*, Kurz F. Fl. Burm., i, 78, not of Bl.

Andamans; Kurz, King's Collector. Nicobars, Kurz.

PLATE 154. *Ryparosa Kurzii*, King. 1, branch with male flowers; 2, raceme of ripe fruit; 3 and 4, seeds: *of natural size*; 5, flower dissected; 6, staminal column: *enlarged*.

PLATE 155.

RYPAROSA WRAYI, King in Journ. As. Soc. Bengal, for 1892, *pt.* 2, *p.* 126.

A tree 60 to 80 feet high, glabrous except the young branches and inflorescence. *Leaves* coriaceous, ovate-lanceolate to oblong or elliptic, the apex sub-acute; the base slightly narrowed; upper surface shining; lower dull yellowish green when dry, the midrib

and 4 pairs of sub-erect nerves prominent below as are the transverse veins; length 5 to 10 in., breadth 1·75 to 4·5 in.; petiole ·75 to 1·25 in., slightly winged at the apex. *Racemes* solitary or in pairs, axillary or from below the leaves, 6 to 9 in. long, longer in fruit. *Male flowers* pedicelled. *Calyx* with 3 broadly ovate teeth, pubescent externally. *Petals* 5, oblong-ovate, pubescent externally, each with a triangular sericeous scale half as long as itself. *Staminal tube* pubescent; anthers 5, ovate, reflexed. *Female flower; sepals* and *petals* as in the male; disc annular, with 5 conical staminodes. Ovary rugulose, pubescent, globular, 1-celled. Stigmas 2, sub-bifid, spreading. *Fruit* globular, crowned by the stigmas, rugose, pubescent, ·5 to ·75 in. in diam., 1-seeded.

Perak; King's Collector, Wray; rather common.

PLATE 155. *Ryparosa Wrayi*, King. 1, branch with male flowers; 2, branch with ripe fruit: *of natural size;* 3, male flower: *enlarged;* 4, sepal of male flower; 5 petal of the same; 6, staminal column: *much enlarged.*

PLATE 156.

RYPAROSA SCORTECHINII, King, in Journ. As. Soc. Bengal, for 1892, *pt.* 2, *p.* 126.

A slender tree; the branchlets and inflorescence rusty, otherwise glabrous. *Leaves* large, thinly coriaceous, oblong-lanceolate or oblanceolate, shortly and abruptly acuminate, gradually narrowed from the middle to the base; both surfaces glabrous, the upper shining, the lower dull, pale; the midrib and 5 to 7 pairs of nerves very prominent; length 10 to 15 in., breadth 3 to 6 in.; petiole 1·5 to 2·5, thickened and bent at the apex. *Racemes* in tufts from tubercles on the stem and large branches, the male 8 to 12 in. long. *Calyx* splitting into 3 ovate segments, tomentose. *Petals* 4, ovate, acute; the gland large, rotund, sericeous. *Female racemes* shorter; sepals and petals as in the male; ovary tomentose, obscurely 4-angled; stigmas 2, discoid. *Fruit* angled when young: when ripe transversely oblong, the apex retuse, 1·5 in., by 1 in., velvetty rusty-tomentose with green or white dots; seeds two, plano-convex.

Perak: Scortechini, Kunstler, Wray; common.

The male flowers have been found only by Scortechini, from whose field notes the above description of them has been taken.

PLATE 156. *Ryparosa Scortechinii*, King. 1, branch with advanced female flowers; 2, raceme of young female flowers; 3, raceme with young fruits; 4, ripe seeds: *of natural size*; 5, petal from female flower; 6, sepal from the same; 7, pistil: *enlarged.*

PLATE 157.

RYPAROSA KUNSTLERI, King in Journ. As. Soc. Bengal, for 1892, *pt.* 2, *p.* 127.

A tree 50 to 60 feet high, the branchlets minutely rusty puberulous. *Leaves* coriaceous, ovate-oblong, obovate-oblong to oblong, shortly and abruptly acuminate, the base narrowed; upper surface shining; lower dull, pale, much reticulate, the midrib and 5 to 7 pairs of nerves very prominent; length 5 to 8 in., breadth 2 to 3 in.; petiole 1 to 1·5 in., swollen and bent towards the apex. *Racemes* axillary, solitary, rarely 2 or 3 from an axil, the male 6 to 8 in. long, the female half as long, flowers pedicelled. *Male flower; calyx* thin, pubescent outside, with 3 ovate broad teeth. *Petals* 5, oblong-

lanceolate, pubescent externally, each with a large sericeous gland at its base; *staminal tube* glabrous, the anthers ovate-oblong. *Female flower*; *sepals* and *petals* as in the male, annular disc at base of ovary small, staminodes none; *ovary* ovoid, angled, tomentose, 1-celled, with 4 parietal bi-ovulate placentas; stigmas obovate, radiating. *Fruit* globular, yellowish, velvetty, about 1·5 in. diam.; *seeds* 5 or 6, oblong, compressed, striate, about ·75 in. long.

Perak, at elevations up to 800 feet, common.

A tree 40 to 100 feet in height, with shorter and (in proportion) broader leaves than *R. fasciculata*, 4 stigmas, and more globular pedicellate fruit.

PLATE 157. *Ryparosa Kunstleri*, King. 1, branch with female flowers and young fruit; 2, ripe fruit (of small size); 3, section of the same: *of natural size*; 4, male flower; 5, female flower: *enlarged*; 6, sepal of male flower; 7, petal of the same; 8, staminal column; 9, pistil: *much enlarged.*

PLATE 158.

RYPAROSA FASCICULATA, King in Journ. As. Soc. Bengal, for 1892, *pt.* 2, *p.* 127.

A glabrous tree 30 to 60 feet high. Young branches lenticellate. *Leaves* thinly coriaceous, narrowly oblong, acuminate, the base narrowed, shining above, pale beneath; midrib, 5 to 7 pairs of lateral nerves, and the bold sub-horizontal transverse nerves and reticulations very distinct especially beneath; length 9 to 15 in., breadth 2·25 to 3·75 in.; petiole 1 to 1·5 in., grooved, thickened in its upper fourth. *Racemes* in fascicles of 4 to 7 from tubercles on the large branches and stem. *Calyx* with 3 broadly ovate teeth. *Petals* rotund, much imbricate and inflexed. *Female* flower with annular disc bearing 5 conical staminodes, the petals with hairy scales at their bases; stigmas 3, large, sub-reniform. *Fruit* rusty-tomentose, pyriform, the apex mamillate and crowned for some time by the remains of the stigmas, about 6-seeded, 1·5 to 2 in. long.

Perak, at elevations up to 800 feet; common.

PLATE 158. *Ryparosa fasciculata*, King. 1, leaf-twig; 2, fascicles of male flowers from a stem-tubercle; 3, fascicles of female flowers; 4, ripe fruits; 5, section of ripe fruit: *of natural size*; 6, male flower (from below); 7, male flower from above; 8, petal; 9, staminal column; 10, female flower from the side: *enlarged.*

PLATE 159.

TRIGONIASTRUM HYPOLEUCUM, Miq. Fl. Ind. Bat. Suppl. I, 395.

Nat. Ord. Polygaleæ.

A slender tree, 30 to 60 feet high; young branches hoary-pubescent; the older with dark brown, lenticellate bark. *Leaves* elliptic-lanceolate, shortly and bluntly acuminate, narrowed to the base; both surfaces shining; the upper glabrous; the lower pale, very minutely scurfy-pubescent, the reticulations and 6 pairs of nerves bold and prominent; length 4 to 5 in., breadth 1·25 to 1·75 in.; petiole ·2 to ·3 in. *Panicles* axillary and terminal, slender, spreading. *Flowers* ·25 in. in diam., shortly pedicellate. *Sepals* 5, pubescent, slightly unequal. *Ovary* hairy. *Samaras* 2 in. long; the

nucleus 1 in. to 1·25 long, triangular, flat; the wing thinly membranous, pale yellow, oblong, its apex blunt, oblique, venation vertical, the areolae wide. King in Journ. As. Soc. Bengal, for 1889, Pt. 2, p. 133. *Isopteris penangiana*, Wall. Cat. 7261.

Penang. Malacca. Perak; common.

The pubescence on the under surfaces of the leaves is so minute that, without a good lens, it is not seen.

PLATE 159. *Trigoniastrum hypoleucum*, Miq. 1, flowering branch; 2, fruiting branch: *of natural size;* 3, flower showing the five petals and two of the sepals: *enlarged;* 4, sepal; 5, lateral petal; 6, the large saccate odd petal; 7, pistil and stamens: *much enlarged.*

XANTHOPHYLLUM, Roxb. *Nat. Ord. Polygaleæ.*

Trees or shrubs. *Leaves* coriaceous or sub-coriaceous, usually drying yellowish-green. *Sepals* 5, nearly equal. *Petals* 5 or 4, the inferior keeled, not crested. *Stamens* 8, distinct, variously attached to the base of the petals, or hypogynous. *Ovary* stipitate, 1-celled, often surrounded by a hypogynous disc.; style more or less filiform, ovules various in insertion and number. *Fruit* 1-celled, 1-seeded, indehiscent. *Seeds* exalbuminous, estrophiolate.

PLATE 160.

XANTHOPHYLLUM ANDAMANICUM, King in Journ. As. Soc. Bengal, for 1890, *pt.*, 2, *p.* 135.

A tree 20 to 30 feet high, glabrous except the inflorescence, branches dark brown. *Leaves* thinly coriaceous, drying a pale greenish passing into brown, elliptic to elliptic-oblong, rarely sub obovate, sub-acute, the base cuneate; upper surface smooth, shining, the lower dull and pale, both minutely reticulate; main nerves 7 to 8 pairs, slightly prominent; length 3 to 4 in., breadth 1·25 to 1·75 in.; petiole ·3 to ·4 in. *Flowers* ·3 in. long, their pedicels about as long. *Panicles* extra-axillary or terminal, 1·5 to 3 in. long, lax, few-branched, slender. *Sepals* ovate to rotund, pubescent, edges ciliolate. *Petals* broadly ovate, glabrous, keel pubescent. *Filaments* flat and pubescent at the base, otherwise cylindric and glabrous. *Ovary* elongate-ovoid, glabrous, 4-ovuled, tapering into the rather flat, pubescent style; disc corrugated, glabrous. *Fruit* globose, ·5 in. in diam., smooth; pericarp thin, crustaceous.

Andaman Islands; Helfer, Kurz, King's Collector. Burma, Kurz.

This is not unlike *X. Griffithii* in its leaves; but it differs in its glabrous ovary and fruit.

PLATE 160. *Xanthophyllum Andamanicum*, King. 1, flowering branch; 2, ripe fruit: *of natural size;* 3, flower dissected; 4, stamens; 5, pistil: *much enlarged.*

PLATE 161.

XANTHOPHYLLUM WRAYI, King in Journ. As. Soc. Bengal, for 1890, *pt.* 2, *p.* 138.

A shrub 3 to 8 feet high, the young branches minutely tomentose. *Leaves* sub-coriaceous, drying a pale yellowish-green, elliptic to oblong, more or less acuminate,

the base rounded or narrowed; upper surface shining; lower slightly dull, pale and rather minutely reticulate; the main nerves 8 to 13 pairs, prominent, forming arches ·2 in. within the edge; length 6 to 12 in., breadth 2·25 to 4·5 in., petiole ·3 to ·6 in. *Flowers* ·35 in. long, their pedicels shorter than the calyx, in terminal or axillary racemes or small panicles less than a third of the length of the leaves. *Sepals* broadly ovate, blunt, puberulous. *Petals* with an oblong or rotund concave obtuse limb, puberulous in the upper, pubescent in the lower half, and with a long claw. *Filaments* epipetalous, flat, pubescent. *Ovary* on a glabrous stalk, densely villous, 4-ovuled, the disc glabrous. *Fruit* globose, ·75 to 1 in. in diam.; when young sericeous, when ripe quite glabrous and boldly verrucose.

Penang, Curtis; No. 677. Perak, King's Collector Wray.

This is not unlike *X affine*, Korth., but is distinguished from that species by its sericeous ovary and deeply warted fruit. In its fruit this resembles *X. Palembanicum* and *P. euryncnum;* but it differs from both in its much larger and more numerously veined leaves.

PLATE 161. *Xanthophyllum Wrayi*, King. 1, flowering branch; 2, ripe fruit; 3, seeds: *of natural size*; 4, flower: *enlarged*; 5, sepal; 6, odd petal with two stamens attached; 7, petal with two stamens attached; 8, petal with single stamen attached; 9, pistil and disc: *much enlarged*; 10, stamens: *very much enlarged*.

PLATE 162.

XANTHOPHYLLUM KUNSTLERI, King in Journ. As. Soc. Bengal, for 1890, *pt.* 2, *p.* 139.

A glabrous tree 50 to 80 feet high; the branchlets robust, dark brown, sub-glaucous. *Leaves* large, coriaceous (with a yellowish green tinge when dry) elliptic to elliptic-oblong, the apex very shortly and rather suddenly acuminate, the edges (when dry) undulate, the base rounded or slightly narrowed to the stout petiole; both surfaces shining; main nerves sub-horizontal, 8 to 12 pairs, prominent beneath as are the secondary nerves and reticulations; length 4·5 to 11 in., breadth 2·25 to 5·25 in., petiole ·6 to ·75 *Flowers* ·6 in. long, shortly pedicellate, in axillary racemes less than half as long as, or in terminal few-branched spreading panicles, longer than the leaves. *Sepals* slightly unequal, ovate-rotund, fleshy, thickened along the midrib, minutely tomentose on both surfaces; the edges thin, ciliolate. *Petals* oblong-obtuse, glabrous except the pubescent sagittate concave keel. *Filaments* with a pubescent ovoid swelling above the base, attached to the base of the petals. *Anthers* bearded at the base. *Ovary* almost sessile, surrounded by a shallow wavy fleshy disc, ovoid, grooved, tomentose, 4-ovulate; style conical, slightly curved, pubescent. *Fruit* globose, ·65 in. in diam. (young), deciduously tomentose; pericarp thick, spongy, the calyx persistent.

Perak, at low elevations, not common. Penang, Government Hill, King's Collector. Curtis, No. 1590.

The stamens of this are united to the base of the petals in an unequal way, three being attached to the odd petal, one to two of the lateral petals, while two petals have no stamens attached to them.

PLATE 162. *Xanthophyllum Kunstleri*, King. 1, flowering branch; 2, large leaf; 3, young fruit; 4, seed: *of natural size*; 5, flower: *enlarged*; 6, odd petal, front view; 7, the same, side view, the 3 stamens being removed from both; 8, lateral petal with one stamen attached: *enlarged*; 9, two stamens; 10, pistil and ovary: *much enlarged*.

PLATE 163.

XANTHOPHYLLUM SCORTECHINII, King in Journ. As. Soc. Bengal, for 1890, *pt.* 2, *p.* 140.

A glabrous tree 25 to 30 feet high. *Leaves* thinly coriaceous, drying brown, ovate, obtusely acuminate, the base more or less cuneate, shining on both surfaces; nerves 3 pairs, sub-erect, not prominent; length 2 to 2·25 in., breadth 1 to 1·35 in., petiole ·35 in. *Flowers* handsome, ·75 in. long, their pedicels ·35 in. *Racemes* axillary, solitary 1 to 1·5 in. long, few-flowered. *Sepals* fleshy, glabrous with ciliolate edges; the three outer ovate blunt, the two inner rotund. *Petals* obovate to elliptic, clawed, glabrescent, the keel puberulous. *Filaments* as long as the petals, flat; anthers short, ovate. *Ovary* shortly stalked, elongated-ovoid, glabrous, 6-ovuled; style little curved, glabrous; stigma capitate; disc small, annular, glabrous. Ripe fruit, globular, sub-glabrous, about 2 in. in diam.; pericarp thick, hard.

Perak. Scortechinii, No. 2079; Wray No. 4028. Penang, Curtis, No. 2407.

PLATE 163. *Xanthophyllum Scortechinii*, King. 1, flowering branch; 2, fruit: *of natural size;* 3, flower, its parts separated; 4, anthers with upper part of filament; 5, ovary style and stigma: *enlarged.*

PLATE 164.

XANTHOPHYLLUM PULCHRUM, King in Journ. As. Soc. Bengal, for 1890, *pt.* 2, *p.* 141.

A glabrous shrub or small tree, the young branches rather robust, the bark very pale. *Leaves* coriaceous, shortly petiolate, elliptic, acute or very shortly and bluntly acuminate, the edges recurved when dry, base rounded or minutely cordate; upper surface shining; lower dull, pale yellow, glaucous, the 5-6 pairs of nerves and the fine reticulations prominent; length 4 to 8 in., breadth 2·25 to 3·5 in.; petiole stout, ·2 in. *Flowers* ·6 in. long, on short thick pedicels, in dense, solitary, axillary, rufous-tomentose racemes half as long as the leaves or less; bracts broadly ovate, concave, deciduous, coloured. *Sepals* nearly equal, ovate-rotund, fleshy, concave, sub-glabrous or puberulous, coloured, the edges thin. *Petals* oblong, blunt, glabrous except the pubescent keel. *Filaments* broad, flat, puberulous, all except one or two inserted in the disc: anthers bearded at the base. *Ovary* ovoid, pointed, tomentose, surrounded by a thin, rather deep, glabrous disc; style glabrescent, slightly curved; ovules 12. *Fruit* globose, ·75 in. in diam., minutely tomentose when ripe, pericarp thin

Perak: rather common. A handsome bush or treelet with yellowish flowers tinged with pink.

PLATE 164. *Xanthophyllum pulchrum*, King. 1, flowering branch; 2, ripe fruit; 3 seeds: *of natural size;* 4, sepal; 5, keel; 6, petal; 7, petals with one stamen attached; 8, seven stamens attached to the disc: *enlarged;* 9, stamen: *much enlarged.*

PLATE 165.

CRATOXYLON MAINGAYI, Dyer in Hook. fil. Fl. Br. Ind. I, 258.

Nat. Ord. Hypericineæ.

A tree 30 feet high, all parts glabrous; young branches with pale brown, ridged bark. *Leaves* thinly coriaceous, elliptic, acute at apex and base; both surfaces shining, the lower paler; main nerves obscure, about 6 pairs; length 2 to 3·5 in., breadth 1 to

1·5 in., petiole ·25 in. *Cymes* axillary, or from above the scars of fallen leaves, few-flowered. *Flowers* ·5 to ·7 in. long, their pedicels ·25 in. *Sepals* oblong, slightly unequal. *Petals* obovate-elliptic, obtuse, clawed, veined, the basal scale acute, stamens in three phalanges. *Styles* 3, longer than the stamens, united below, stigmas capitate. *Capsule* ·5 in. long, narrowly cylindric. *Seeds* ·25 in. long, with oblong unilateral wing. King in Journ. As. Soc. Bengal, for 1890, pt. 2, p. 145.

Penang; Maingay.

Apparently an uncommon tree, since only Maingay has as yet collected it.

PLATE 165. *Cratoxylon Maingayi*, Dyer. 1, flowering, and 2, fruiting branch: *of natural size*; 3, flower dissected: *enlarged*; 4 and 5, phalanges of stamens; 6, anthers; 7, pistils: *much enlarged*.

GARCINIA, Linn.

Nat. Ord. Guttiferæ.

Trees, usually with yellow juice. *Leaves* evergreen, coriaceous, very rarely stipulate. *Flowers* solitary, fascicled, or panicled, axillary or terminal, polygamous. *Sepals* 4-5, decussate. *Petals* 4-5, imbricate. MALE FL.; *Stamens* ∞, free, or collected into a ring, or an entire globose or conical 4-5-lobed mass, often surrounding a rudimentary ovary; anthers sessile, or on short thick filaments, 2-rarely 4-celled, adnate or peltate, dehiscing by slits or pores, or circumscissile. FEMALE OR HERMAPHRODITE FL.; *Staminodes* 8-∞, free or connate. *Ovary* 2-12-celled; stigma sessile or sub-sessile, peltate, entire or lobed, smooth or tubercled; ovules solitary in each cell, attached to the inner angle of the cell. *Berry* with a coriaceous rind. *Seeds* with a pulpy aril.

PLATE 166.

GARCINIA OPACA, King in Journ. As. Soc. Bengal, for 1890, *pt.* 2 p. 160.

A tree 40 to 60 feet high; the branchlets (when dry) dull dirty yellow, striate. *Leaves* oblong, narrowed at each end, the apex more or less acuminate, the base cuneate; upper surface slightly shining, lower surface opaque, whitish; the rather numerous nearly horizontal nerves thin, little visible on either surface, the midrib bold and prominent on both; length 4 to 5 in., breadth 1·75 to 2·25 in., petiole ·6 in. *Male flowers* ·75 in. in diam., in shortly pedicelled, 2- to 3-flowered, ebracteolate, terminal or axillary cymes; pedicels ·25 in., annulated; *sepals* 4, ovate, concave, thin, veined; *petals* 4, similar to the sepals, but a little larger; *stamens* numerous, on a single, convex, fleshy receptacle; *anthers* sessile, depressed-globular, with circumscissile dehiscence; rudimentary *stigma* 0. *Female flowers* solitary, terminal: *sepals* more coriaceous than those of the male flower; staminodes 0; *ovary* cylindric; stigma convex, smooth, the edge irregularly subcrenate. *Fruit* solitary, terminal, ovate-globose, slightly mammillate, crowned by the broad flat stigma which has 4 broad shallow rounded lobes; the sepals rounded, cartilaginous, persistent; pericarp brown when dry, thin, crustaceous. Seeds several, ovoid, flattened on one side. *G. cornea*, Wall. Cat. 4852 E.

Perak; King's Collector, Scortechini.

Distinguished by its leaves opaque and whitish beneath and with faint sub-horizontal nerves. In fruit this resembles *G. Penangiana;* but it has a very different stigma.

PLATE 166. *Garcinia opaca*, King. 1, branch with male flowers; 2, female flower; 3, ripe fruit: *of natural size;* 4, male flower dissected; 5, single stamen: *enlarged.*

PLATE 167.

GARCINIA KUNSTLERI, King in Journ. As. Soc. Bengal, for 1890, *pt.* 2, p 165.

A shrub, 6 to 8 (rarely 15) feet high; the young branches dark-coloured, not-angled. *Leaves* membranous, oblanceolate to narrowly ovate-lanceolate, shortly but sharply acuminate, the base much narrowed; smooth on both surfaces, the lower rather pale; nerves indistinct, spreading, 9 to 13 pairs, some of the intermediate almost as distinct as the primary; length 3·5 to 5 in., breadth 1·15 to 1·8 in., petiole ·35 to ·6 in. *Male flowers* about ·15 in. in diam., in small axillary or terminal fascicles of 3 to 6. *Sepals* 4, ovate-orbicular, membranous, concave. *Petals* 4, broadly ovate, blunt, fleshy, concave. *Stamens* about 15, forming a convex mass; the anthers transversely flattened, 4-celled, the connective broad; rudimentary pistil 0. *Female flowers* solitary; *sepals* 4, orbicular, membranous, veined. *Petals* 0. Staminodes 4, with filaments half as long as the ovary, and flat square heads. *Ovary* thick, cylindric, vertically grooved; the stigma convex, with large prominent black-tipped conical papillæ, and with about 10 inconspicuous lobes. *Fruit* orange-yellow, depressed, sub-globose, about 1·25 in. in diam., smooth, the sepals persistent at its base for some time.

Perak, at low elevations, common: King's Collector, Scortechini, Wray.

This is allied to the Burmese *G. linoceiroides*, T. Anders.; but has smaller flowers, fewer stamens and more acuminate leaves.

PLATE 167. *Garcinia Kunstleri*, King. 1, twig with male flowers; 2, ripe fruit: *of natural size;* 3, male flower; 4, two petals; 5, two sepals; 6, staminal column: *enlarged.*

PLATE 168.

GARCINIA WRAYI, King in Journ. As. Soc. Bengal, for 1890, *pt.* 2, *p.* 152.

A small spreading tree; young branches very slender, dirty yellow. *Leaves* thinly coriaceous, ovate or elliptic, the apex produced into a long sub-spathulate point, the base cuneate; upper surface shining, the lower dull, pale; nerves slender, sub horizontal, ·05 in. apart, invisible on the upper and faint on the lower surface even when dry; length 2 to 2·5 in., of which the apical tail is sometimes as much as ·75 in., breadth ·8 to 1·2 in.; petiole ·2 in. *Male flowers* ·25 in. in diam., in pedunculate axillary fascicles of 2 or 3; buds globose, pedicels ·15 in.; perianth reflexed; *sepals* 4, the outer less than half as large as the inner pair, all orbicular, sub-coriaceous and concave; *petals* 4, orbicular, blunt, with a thickened spot near the base, covering the stamens in bud: *stamens* numerous, on both surfaces of 4 fleshy processes; anthers sessile, globular-oblong, the connective rather thick, 2-celled, dehiscence vertical; rudy. style cylindric; stigma sub-lobulate, convex. *Female flowers* axillary, solitary, or clustered like the males; *sepals* 4, orbicular, thin, concave, about the same size as the petals and neither sepals nor petals quite covering the stigma in bud: *petals* 4, orbicular, concave, with a coloured

thickened spot near the base, staminodes none; *ovary* cylindric; *stigma* hemispheric, smooth, entire, enveloping the upper part of the ovary, ultimately becoming discoid and slightly depressed in the middle. Young fruit cylindric, crowned by the stigma which has become flattened.

Perak; on Ulu Batang Padang and on Gunong Batu Pateh, at elevations of 4,500 feet and upwards. Wray, Nos. 267, 362, 1527; Scortechini, No. 323*b*.

I have not seen ripe fruit of this, but (judging from the appearance of a young one) it is probably ovoid. In its leaves, this species rather resembles *G. merguensis* and *G. rostrata*.

PLATE 168. *Garcinia Wrayi*, King. 1, branch with male flowers; 2, branch with very young fruit: *of natural size;* 3, male flower with the petals and rudimentary stigma removed; 4, petal of male flower; 5 & 6, two groups of stamens; 7, front of a stamen; 8, back of same; 9, rudimentary stigma of male flower; 10 & 11, petals of female flower; 12, stigma and ovary of female flower: *enlarged.*

PLATE 169.

GARCINIA ANDAMANICA, King in Journ. As. Soc. Bengal, for 1890, *pt.* 2, *p.* 170.

A tree from 20 to 40 feet high; young branches 4-angled, pubescent. *Leaves* elongate-ovate, often inequilateral, sub-acute; the base broad, rounded or slightly cordate; both surfaces glabrous, shining; main nerves 14 to 16 pairs, rather prominent; length 8 to 11 in., breadth 4 to 5·5; petiole ·5 in., stout. *Male flowers* about ·3 in. in diam., in short dense axillary ascicles from short wart-like branches below the leaves. *Sepals* 5, sub-coriaceous, ovate-rotund, imbricate, pubescent externally. *Petals* 5, larger than the sepals, thin, rotund, clawed, imbricate, puberulous. *Stamens* indefinite, in 5 thick fleshy bundles; anthers minute, sub-globular, introrse. *Disk* of 5 broad corrugated glands much shorter than the bundles of stamens and alternating with them. *Pistil* 0. *Female flower* unknown. *Fruit* sub-globular or obliquely ovoid, smooth, bright yellow, 1 to 1·5 in. long and ·75 to 1·25 in. in diam., shortly apiculate, tapering to the base; the 5-lobed stigma persistent for some time. *G. dulcis*, Kurz (not of Roxb.), For. Flora Burma i, 92; Pierre Fl. Forest Cochin-Chine, fasc. vi, p. vi, *in part.*

Andaman Islands; Helfer No. 872, Kurz, King's Collector, No. 224.

This species was considered by Kurz to be identical with *Xanthochymus dulcis*, Roxb., a native of the Moluccas cultivated in the Botanic Garden, Calcutta. It does not, however, agree with specimens still in cultivation there, nor with Roxburgh's description. Pierre (l. c.) expresses his doubt as to the indentity of the Andaman and Molucca plants: but he adopts Kurz's name for the latter. This species is closely allied to *G. Villersiana*, Pierre, a common Cambodian plant. The leaves of the latter, as shown in Pierre's figure (Fl. Forest. Cochin-Chine, t. 21) have, however, more nerves; the flowers have longer pedicels, and the staminal bundles are longer and more slender than in this species; the lobes of the disk are also narrower and longer.

This is the Helferian plant referred to under *G. Xanthochymus* in Fl. Br. Ind. i, 269, as allied to, but differing from, that species. There is a variety of this with the leaves shortly pubescent beneath.

PLATE 169. *Garcinia Andamanica*, King. 1, branch with male flowers; 2, nearly ripe fruit; 3, section of the same; 4, seeds: *of natural size;* 5, male flower opened up; 6, sepal; 7, petal; 8, the five fascicles of stamens, glands and rudimentary ovary: *enlarged;* 9, a fascicle of stamens with two of the glands of the disc at its base; 10, rudimentary ovary: *much enlarged.*

CALOPHYLLUM, Linn. *Nat. Ord. Guttiferae.*

Trees. *Leaves* opposite, shining, coriaceous, with innumerable parallel slender veins at right angles to the midrib. *Flowers* polygamous, in numerous axillary or terminal panicles. *Sepals* and *petals* 4-12, imbricate in 2-3 series. *Stamens* very many, filaments filiform, often flexuous, free or connate below; anthers erect, 2-celled, dehiscence vertical. *Ovary* 1-celled, style slender, stigma peltate; ovule solitary, erect. *Drupe* with a crustaceous putamen. *Seed* erect, ovoid or globose; testa thin, or thick and spongy.

PLATE 170.

CALOPHYLLUM PRAINIANUM, King in Journ. As. Soc. Bengal, for 1890, *pt.* 2, *p.* 175.

A glabrous tree 40 to 60 feet high; the youngest branchlets polished, terete, yellowish. *Leaves* thinly coriaceous, elliptic-oblong, shortly sub-abruptly and obtusely acuminate, narrowed in the lower third to the short petiole; the nerves rather distinct on both surfaces; lower surface paler than upper, both shining; the edge pale yellow, very slightly thickened: length 2·5 to 4 in., breadth 1 to 1·5 in., petiole 2·5 to 4 in. *Racemes* solitary, axillary, rarely supra-axillary, about 1·5 in. long, ebracteate, lax, few-flowered. *Flowers* ·25 in. in diam.; pedicels slender, ·25 in., the upper rather longer. *Sepals* 4; the outer pair orbicular, concave, puberulous externally; the inner pair larger, imbricate, orbicular-oblong, glabrous. *Petals* 0. *Ovary* ovoid, stigma very broad. *Fruit* sub-spherical, ·4 in. in diam., pericarp thin.

Perak; King's Collector, Nos. 5366 and 7243.

Very like *C. pulcherimum*, but with globular fruit: also like *C. Teysmannii*, but the nervation of the leaves in that species is unusually oblique for the genus, whereas in this the nerves are almost horizontal.

PLATE 170 *Calophyllum Prainianum*, King. 1, flowering branch; 2, fruiting branch: *of natural size*; 3 and 4, outer sepals; 5 and 6, inner sepals; 7, andro-gynoecium: *enlarged*; 8 and 9, stamens; 10, pistil; 11, the same showing vertical section of ovary: *much enlarged*.

PLATE 171.

CALOPHYLLUM SUBSESSILE, King n. sp.

A glabrous tree 60 to 80 feet high; the young branches 4-angled, shining. *Leaves* coriaceous, elliptic-oblong, entire, the apex obtuse or emarginate, the base minutely cordate, both surfaces shining, the edge slightly revolute when dry; length 3·5 to 6 in., breadth 1·75 to 2·5 in., petiole only about ·1 in. long. *Racemes* solitary, few-flowered; bracts small, ovate, deciduous, distichous. *Flowers* ·5 in. in diam., greenish-white; pedicels slender, longer than the flowers. *Sepals* rotund, concave, the *petals* similar but more membranous. *Ovary* globose, striate, about as long as the cylindric style. *Fruit* globular, minutely pubescent, 1 in. or more in diam.

Perak: King's Collector Nos. 6877, 7311.

PLATE 171. *Calophyllum subsessile*, King. 1, flowering branch; 2, ripe fruit: *of natural size*; 3, andro-gynœcium; 4, sepal; 5, petal: *slightly enlarged*; 6, ovary and style; 7, anthers: *much enlarged*.

PLATE 172.

KAYEA, Wall. *Nat. Ord. Guttiferæ.*

Trees. *Leaves* opposite, sub-coriaceous. *Flowers* hermaphrodite, either large and solitary, or small and paniculate. *Sepals* and *petals* 4 each, imbricate. *Stamens* numerous; filaments slender, free or connate at the base; anthers small, sub-globose, 2-celled, with vertical dehiscence. *Ovary* 1-celled; style slender, stigma acutely 4-fid; ovules 4, erect. *Fruit* subdrupaceous, fleshy, indehiscent, 1-4-seeded. *Seeds* thick, testa thin and crustaceous.

KAYEA GRANDIS, King in Journ. As. Soc. Bengal, for 1890, *pt.* 2, *p.* 182.

A glabrous tree, 40 to 80 feet high. *Leaves* large, thinly coriaceous, oblong to elliptic-oblong, sub-acute, the edges revolute (when dry), slightly narrowed towards the rounded or sub-acute base; both surfaces rather dull (when dry), the 20 to 30 pairs of main nerves sub-horizontal, prominent, the secondary nerves also prominent; length 9 to 18 in., breadth 3 to 4·5 in.; petiole ·4 to ·75 in., smooth. *Flowers* globose in bud, pedicelled, in short few-flowered axillary cymes crowded in the axils of the leaves, rarely solitary, about 1 in. in diam. when expanded; pedicels about ·5 in. *Sepals* unequal, rotund, the outer concave, very coriaceous; the inner thin, not larger than the outer. *Petals* elliptic-oblong, acute, larger than the sepals (·5 in. long or more). *Ripe fruit* turbinate, 2 to 2·5 in. in diam. and 1·25 in. long, the epicarp leathery, completely enveloped by the persistent, thickened, outer sepals.

Malacca; Maingay (Kew Distrib. 178), Cantlay No. 2354. Perak, King's Collector, Nos. 3897, 7294, 7340.

A very fine species; at once distinguished by its large leaves and depressed turbinate fruit. The fruit, and probably the whole plant, abounds in yellow juice. According to M. Cantley the wood sinks in water.

PLATE 172. *Kayea grandis*, King. 1, flowering branch; 2, ripe fruit; 3, section of ripe fruit: *of natural size;* 4, outer sepal; 5, inner sepal; 6 and 7, petals; 8, stamens; 9, pistils: *slightly enlarged;* 10A, stamen: *much enlarged.*

PLATE 173.

KAYEA KUNSTLERI, King in Journ. As. Soc. Bengal, for 1890, *pt.* 2, *p.* 182.

A glabrous tree 30 to 50 feet high; the branchlets brownish, striate, not tuberculate. *Leaves* thinly coriaceous, elliptic-lanceolate, acuminate, sub-undulate, the base much narrowed to the petiole; both surfaces rather dull (when dry) with a few scattered opaque black dots; the lower pale, sub-glaucescent (when dry); length 4 to 6 in., breadth 1 to 2·25 in.; petiole ·25 in. to ·4 in., rugose; nerves 12 to 20 pairs, unequal, slightly prominent; the lower horizontal, the upper slightly curving upwards. *Flower* solitary or in clusters of 3 or 4, axillary or terminal, ·75 to 1·5 in. diam., on a very short smooth pedicel, bracts at its base linear-subulate; bud globose, smooth. *Sepals* unequal as in *K. nervosa.* *Petals* oblong-acuminate, ·75 to 1 in. long. Ripe fruit ovoid, gradually narrowing into a short subulate apical beak, 1 to 1·25 in. long.

Perak: King's Collector, Nos. 3301, 6850. Penang, Curtis, No. 1419. Malacca, Maingay, No. 176.

This is allied to *K. nervosa*, T. Anders.; but it is readily distinguished from that by its smooth branchlets, by the leaves much and gradually narrowed to both base and apex, and by the oblong-acuminate petals. A shrubby form of this occurs in Penang (Curtis, Nos. 805, 1418), and in Perak (King's Collector, No. 1345), in which all the parts are smaller and the leaves are less acuminate at the apex, and rounded instead of much attenuated at the base.

PLATE 173. *Kayea Kunstleri*, King. 1, flowering branch; 2, pistil; 3, fruit (immature): *of natural size;* 4, flower, its parts separated: *enlarged;* 5, stamens, *much enlarged.*

PLATE 174A.

Kayea Manii, King n. sp.

A glabrous tree. Young branches slender, polished, the bark pale brown (when dry). *Leaves* coriaceous, narrowly oblong, tapering to each end, the apex acuminate, the base acute; main nerves about 15 pairs, slightly prominent on the lower surface when dry, curving, both surfaces shining; length 5 to 7 in., breadth about 1·4 in., petiole ·3 in. *Racemes* several from an axil, umbellate, 1·5 to 2·5 in. long, slender, bracts (if any) deciduous. *Flowers* nearly ·5 in. in diam., on slender pedicels ·4 to ·6 in. long. *Sepals* ovate-orbicular, concave. *Petals* broadly ovate, concave, slightly smaller than the sepals. *Stamens* much longer than the petals, very numerous; *anthers* broadly ovate. Pistil longer than the stamens. *Ovary* conical, sub-compressed, boldly ridged, glabrous, tapering into the cylindric style. *Stigma* with three linear lobes. *Unripe fruit* compressed; the style persistent, enveloped in the accrescent sepals. *Mesua Singaporeana*, Wall. Cat. No. 4836.

Singapore: Wallich, Andaman Islands. Mr. E. H. Man.

The Andamans' specimens agree perfectly with Wallich's No. 4836, which had been erroneously referred to *Kayea racemosa*, Planch. by the late Dr. T. Anderson in Hooker's Flora of British India,—a reduction, however, not sanctioned by the authors of that species. This species is a perfectly distinct one; and I dedicate it to Mr. E. H. Man, C.I.E., of the Andamans Commission, a gentleman who has given much willing help in the exploration of the dense forests of these magnificent islands.

PLATE 174A. *Kayea Manii*, King. 1, flowering branch; 2, young fruit: *of natural size;* 3, sepal; 4, petal; 5, andro-gynœcium, opened out; 6, stamens; 7, pistil with vertical section of ovary: *enlarged.*

PLATE 174B.

Kayea Curtisii, King n. sp.

A tree, all parts glabrous; the young branches thin, polished, dark-coloured when dry. *Leaves* thickly coriaceous, narrowly elliptic-oblong, tapering to each end, the apex acute or acuminate, the base acute; main nerves 15 to 17 pairs, spreading, rather prominent beneath when dry; both surfaces smooth, the lower shining and paler; length 2·5 to 3·5 in., breadth ·75 to 1 in., petioles ·2 to ·3 in. *Flowers* solitary, leaf-opposed, ·75 in. in diam., on pedicels ·2 in. long. *Sepals* broadly ovate-elliptic. *Petals* slightly smaller than the sepals, obovate elliptic, shortly acuminate. *Stamens* numerous, longer than the corolla; anthers reniform with broad central connective. *Pistil* longer than the stamens the ovary ovoid-conic, tapering into the curved cylindric style.

Stigma with 4 linear teeth. *Unripe fruit* ovoid, apiculate, half-enveloped by the accrescent sepals.

Penang: Curtis; Nos. 748 and 805.

PLATE 174B. *Kayea Curtisii*, King. 1, flowering twig; 2, twig with young fruit: *of natural size*; 3, flower; 4, sepal; 5 and 6, petals; 7, stamens; 8, pistil; 9, section of ovary: *enlarged*.

PLATE 175.

TERNSTRŒMIA SCORTECHINII, King in Journ. As. Soc. Bengal, for 1890, *pt.* 2, *p.* 193.

Nat. Ord. Ternstrœmiaceæ.

A tree, 20 to 40 feet high; young branches with pale brownish-grey bark, striate when dry. *Leaves* coriaceous, verticellate, drying of a pale green, oblanceolate, the apex shortly abruptly and rather bluntly acuminate, narrowed from above the middle to the rather stout short petiole, edges entire, under surface rather pale; midrib distinct on both surfaces, nerves visible on neither; length 3 to 5 in., breadth 1·25 to nearly 2 in.; petiole ·4 to ·5. *Flowers* dioecious, ·6 to ·8 in. in diam., pedunculate, axillary, solitary or in fascicles of 2 to 6; peduncles slender, compressed, 1 to 1·5 in. long; the 2 bracteoles about ·2 in. below the calyx, minute, fugacious. *Sepals* subequal, fleshy with thin edges, rotund. *Petals* much larger than the sepals, orbicular to reniform, clawed. *Stamens* in the male very numerous; anthers sub-sessile, the connective broad, bearing the 2 cells on its edges and produced above them into a broad short truncate process; rudimentary ovary flattish, without stigma. *Female flowers* like the males but with fewer stamens; *ovary* hemispheric, imperfectly 2-celled; stigmas 2, sub-sessile, flat, foliaceous, each divided into 3 or 4 lobes with thick corrugated edges. *Fruit* a dry ovoid berry with coriaceous dark-coloured epicarp, ·75 in. long, and ·6 in. in diam., subtended by the leathery calyx. *Seeds* 2, large, broad, horse-shoe-shaped, flattish, ·5 in. long.

Perak, at low elevations; Scortechini, King's Collector.

A very distinct species with smaller flowers than the other species of the genus.

PLATE 175. *Ternstrœmia Scortechinii*, King. 1, flowering branch; 2, ripe fruits: *of natural size*; 3, andrœcium 4, petal; 5, two anthers; 6, young fruit; 7, young seed: *enlarged*.

PLATE 176.

ACTINIDIA MIQUELII, King in Journ. As. Soc. Bengal, for 1890, *pt.* 2, *p.* 196.

Nat. Ord. Ternstrœmiaceæ.

Slender, scandent, 30 to 60 feet long; young branches cylindric, striate, glabrous, dark-coloured. *Leaves* membranous, ovate, sub-acuminate to sub-rotund, mucronate, minutely glandular-dentate, the base rounded or slightly cordate; upper surface glabrous, rigid, the nerves and midrib minutely pubescent; lower surface pale brown when dry, minutely but densely tomentose; nerves about 5 or 6 pairs, the lower spreading, the upper sub-erect, prominent beneath as are the midrib and transverse

veins; length 3 to 4 in., breadth 2·5 to 3·5 in.; petiole 1·25 to 1·5 in., slender. *Cymes* axillary, dichotomous, spreading, rusty-tomentose, on slender ebracteate peduncles 1·25 in. long which lengthen to 3 in. in fruit. *Flowers* numerous, diœcious, ·5 in. in diam.; pedicels ·3 to ·4 in. long. *Sepals* 5, thick, ovate, blunt, densely rusty-tomentose externally. *Petals* 5, larger than the sepals, membranous, oblong-obovate, blunt. *Stamens* in the males very numerous, glabrous; the anthers broadly oblong, blunt, deeply cordate at the base; filaments slender. *Ovary* in the males absent or rudimentary, densely pilose, and with several rudimentary styles. *Female flowers* unknown. *Fruit* ovoid, ·75 in. long, and ·5 in. in diam., baccate, smooth, pulpy, subtended by the persistent calyx and crowned by the remains of 15 to 20 filiform styles. *Seeds* numerous, shining, brown, less than ·1 in. long, ovoid, sub-compressed, pitted and with several longitudinal rooves. *Kadsura pubescens*, Miq. Fl. Ind. Bat. Suppl. 620.

Perak; on trees, at elevations of 3,500 to 4,000 feet, King's Collector, Nos. 5437 and 8789. Distrib.—Eastern Sumatra.

I have carefully examined a type specimen of Miquel's *Kadsura pubescens* from Sumatra named by the author's own hand; and there is no doubt whatever that it is an *Actinidia* and not a *Kadsura;* nor is there any that it is identical with the above quoted numbers of the Calcutta collector from Perak. Miquel is quite wrong in describing his plant as having 3 sepals and 6 petals, there being 5 in each whorl.

PLATE 176. *Actinidia Miquelii,* King. 1, fruiting branch; 2, cyme with young fruit: *of natural size;* 3, stamens; 4, sepal; 5, petal; 6, stamens; 7, ovary; 8, styles: *enlarged.*

PLATE 177.

PYRENARIA KUNSTLERI, King in Journ. As. Soc. Bengal, for 1890, *pt.* 2, *p.* 200.

Nat. Ord. Ternstrœmiaceæ.

A tree 15 to 30 feet high; all parts glabrous except the very apices of the branches, the youngest leaf-buds, and the flowers. *Leaves* elliptic, or elliptic-oblong to oblong-oblanceolate, mostly acuminate, faintly serrate in the upper three-fourths; the base entire, acute; both surfaces, but especially the lower, much pustulate when dry; the lower brown, the upper greenish; midrib and 6 to 8 pairs of erecto-patent main nerves rather prominent below, the latter interarching far from the edge; length 5 to 7 in., breadth 1·8 to 2·5 in., petiole ·3 to ·4 in. *Flowers* ·6 to ·75 in. in diam., on peduncles ·1 in. long; bracteoles 2, opposite, broad, close to the calyx. *Sepals* 5, rotund, coriaceous, pubescent externally. *Petals* 5, larger than the sepals, rotund, glabrous, fleshy with thin edges, white, connate at the base. *Stamens* numerous; anthers broadly ovate, apiculate, 4 or 5 times as long as the slightly flattened filaments, adnate to the base of the petals. *Ovary* ovoid-conic, ridged, adpressed-pubescent, 5-celled. *Style* short, cylindric, glabrous, 5-ridged. *Stigmas* small, acute, connivent. *Fruit* 1·25 to 1·5 in. long, and about as much in diam., broadly ovoid, bluntly 5-ridged, pubescent. *Seeds* few, ovate, sub-compressed, ·6 in. long.

Perak; at elevations of 500 to 2,000 feet. King's Collector.

PLATE 177. *Pyrenaria Kunstleri,* King. 1, flowering branch; 2, flower; 3, andro-gynœcium; 4, ripe fruit; 5, section of ripe fruit; 6, seed; 7, section of seed: *of natural size;* 8 and 9, sepals; 10 and 11, petals; 12, ovary and stamens: *enlarged;* 13, two stamens: *much enlarged.*

PLATE 178.

PYRENARIA WRAYI, King in Journ. As. Soc. Bengal, for 1890, *pt.* 2, *p.* 201.

A bush; the young branches pale, minutely adpressed-pubescent towards the apices as are the leaf-buds. *Leaves* thinly coriaceous, oblong-oblanceolate, shortly acuminate, obscurely crenate-serrate to sub-entire; the base attenuate, entire; both surfaces glabrous, the lower yellowish-green, pustulate when dry, the upper greenish; midrib prominent, especially beneath; main nerves 10 to 12 pairs, interarching ·25 in. from the margin, rather prominent beneath; length 6 to 10 in, breadth 1·75 to 3 in.; petiole ·3 to ·5 in, stout. *Flowers* ·5 in. in diam., buds globose, peduncle very short, glabrous; bracteoles 3, broadly ovate, connate just below the calyx. *Sepals* 6, increasing in size inwards, rotund, minutely pubescent externally. *Petals* 6, rotund, concave, thinner than the sepals, puberulous externally with broad glabrous edges. *Stamens* numerous; anthers broadly ovate, about one-fourth as long as the filaments. *Ovary* shortly ovate-conic, with much white hair, 5- or 6-celled. *Styles* 3, united for half their length; stigmas vertically flattened. Ovules 2 in each cell. *Fruit* sub-globular, bluntly 5-ridged, deciduously pubescent, 1·25 in. in diam. *Seeds* ovoid, sub-compressed, smooth, ·6 in. long, the hilum very large.

Perak, at low elevations; Wray, Scortechini.

Closely allied to *P. Kunstleri;* but the leaves have many more nerves, the flowers are 6-merous with only 3 styles, and the fruit is more globular than in that species.

PLATE 178. *Pyrenaria Wrayi,* King. 1, twig with flower buds; 2, twig with ripe fruit; 3, transverse section of ripe fruit; 4 & 5, seeds: *of natural size;* 6, sepal; 7, petal; 8, stamens; 9, ovaries and styles: *enlarged;* 10 & 11, stamens: *much enlarged.*

PLATE 179A.

GORDONIA MAINGAYI, Dyer in Hook. fil. Fl. Br. Ind. I, 291.

Nat. Ord. Ternstrœmiaceæ.

A tree 30 to 40 feet high; young branches slender, with glabrous pale roughish bark, pubescent towards the apices. *Leaves* coriaceous, broadly oblanceolate, shortly and bluntly acuminate, obscurely serrulate in the upper two-thirds, the lower third gradually attenuate, entire; both surfaces glabrous, the upper greenish, the lower brownish when dry, the midrib bold and sparsely pubescent beneath; lateral nerves 6 pairs, indistinct; length 2·5 to 3 in., breadth 1 to 1·4 in., petiole ·25 in. *Flowers* sub-sessile, ·8 to 1 in. in diam., buds sub-globular; bracts sepals and petals forming a cone, all adpressed-sericeous externally except the glabrous edges; pedicels about ·15 in. long. *Sepals* and petals orbicular, blunt or retuse. *Stamens* numerous; anthers ovoid; filaments much longer, slender. *Ovary* ovoid-conic, vertically ridged, adpressed-sericeous, 4- or 5-celled. *Style* single, angled. Stigmas 4 or 5, acute, connivent. *Capsules* 4-to 5-angled, woody, 1 to 1·25 long, ·5 to ·6 in diam., 4- or 5-celled, backs of valves flat. *Seeds* ·9 in. long, of which three-fourths are wing. King in Journ. As. Soc. Bengal, for 1890, pt. 2, p. 204.

Malacca; Maingay, No. 192. Perak; Scortechini, Wray; at about 1000 feet.

PLATE 179A. *Gordonia Maingayi,* Dyer 1, flowering branch; 2, branch with ripe fruit; 3, petal; 4, stamens; 5, pistil; 6, pistil, with section of ovary; 7 & 8, stamens: *enlarged;* 9, seed; *of natural size.*

PLATE 179B.

GORDONIA IMBRICATA, King in Journ. As. Soc. Bengal, for 1890, *pt.* 2, *p.* 204.

A tree? Young branches rather stout, glabrous, dark purplish-brown when dry. *Leaves* coriaceous, oval-oblong, sometimes slightly oblanceolate, the apex obtuse, slightly emarginate, the edges thickened and slightly recurved, quite entire or very faintly sub-serrulate; the base slightly narrowed, roundish; both surfaces shining, the upper greenish; the lower dull, tinged with brown when dry, midrib bold; nerves about 12 pairs, thick but inconspicuous; length 1·75 to 2·25 in., breadth ·9 to 1·25 in.; petiole ·15 in. stout. *Flowers* only in the upper axils, about 1 in. in diam., axillary, solitary, sub-sessile; the buds elongate-obovoid; the bracts numerous, closely imbricate, passing into the sepals, all orbicular and pubescent externally with broad scarious glabrous edges. *Petals* much larger than the sepals, orbicular, densely and minutely pubescent externally, fleshy with thin glabrous edges. *Stamens* numerous; anthers ovate, about one-fourth of the length of the slender cylindric filaments. *Ovary* ovoid-conic, ridged, adpressed-pubescent, 5-celled. *Style* single, boldly 5-ridged; stigmas distinct, small. *Fruit* slightly under 1 in. long, ·4 in. in diam., 5-angled, adpressed-pubescent, subtended by the elongate imbricate cup formed by the sepals and bracts. *Seeds* ·75 in. in length, of which one-half is wing.

Perak; Scortechini, No. 402b.

Father Scortechini's scanty specimens are accompanied by no notes; but, from the species of *Hymenophyllum* growing on the branches of some of them, I conclude that they were collected probably at elevations of 4,000 or 5,000 feet. The remarkable imbricate buds at once distinguish this species.

PLATE 179B. *Gordonia imbricata*, King. 1, branch with flower and ripe fruit; 2, vertical section of a capsule; 3, seeds removed from capsule; 4, single seed: *of natural size.*

PLATE 180.

DIPTEROCARPUS KUNSTLERI, King in Journ. As. Soc. Bengal, for 1890, *pt.* 2, *p.* 87.

Nat. Ord. Dipterocarpeæ.

A tree 80 to 120 feet high; young branches flattened, at first sparsely covered with minute scurfy deciduous pubescence, ultimately glabrous, but always with oblique tawny-tomentose annuli. *Buds* narrowly cylindric, hoary-canescent. *Leaves* elliptic or sub-rotund-elliptic, very shortly acuminate, the base rounded or sub-cuneate, the edges undulate or sub-cuneate, both surfaces glabrous; main nerves 15 to 18 pairs, oblique, straight, prominent on the lower surface, length 7·5 to 11 in., breadth 4·5 to 7 in., petiole 1·5 to 2 in. *Racemes* 6 to 8 in. long, often bifid, 4- to 6-flowered, glabrous. *Flowers* 2·5 to 3 in. long, glaucous. *Calyx-tube* narrowly obconic, 5-winged. *Petals* linear, obtuse, glaucous. *Fruit* ovoid, an inch and a-half or more long, with 5 wings about ·25 in. wide: accrescent calyx-lobes oblong, obtuse, slightly narrowed towards the base, glabrous, reticulate, 3-nerved, 6 or 7 in. long and about 1·5 in. broad.

Perak: King's Collector, Nos. 3638, 3798, 7508 and 7606.

Allied to *D. grandiflorus*, Blanco; but with larger leaves, smaller fruit and different buds. Allied also to *D. Griffithii*, Miq., but with smaller fruit and different buds. This species has leaves like *D.*

trinervis, Bl. and *D. retusus*, Bl.; but it differs from these in having winged fruit: it also resembles *D. Dyeri*, Pierre, which, however, has longer leaves with hairy petioles and more narrowly-winged fruit.

Plate 180. *Dipterocarpus Kunstleri*, King. 1, leaf and ripe fruit; 2, two flowers from which the petals and stamens have fallen: *of natural size*.

Vatica, Linn.

Large or moderately sized resinous trees. *Leaves* coriaceous, entire, feather-veined and finely reticulate; stipules small, fugacious or inconspicuous. *Flowers* in axillary and terminal panicles, usually tomentose before expansion. *Calyx-tube* short, free, or adnate to the base of the ovary; segments somewhat acute, imbricate, then sub-valvate. *Stamens* 15; anthers oblong, external valves larger, connective apiculate. *Ovary* 3-celled; style short, subulate, or apex clavate or capitate; stigma entire or 3-toothed; ovules 2 in each cell. *Fruit* leathery, indehiscent, 1-seeded, surrounded by and sometimes partly adnate to the accrescent, membranous, nerved and reticulate calyx-lobes, two of which expand into narrow wings 2 or 3 in. long, the other three being much smaller. *Cotyledons* fleshy.

Distrib.—Tropical Asia and chiefly Malaya; species about 10.

PLATE 181.

Vatica perakensis King in Journ. As. Soc. Bengal, for 1893, *pt.* 2, *p.* 103.

Nat. Ord. Dipterocarpeæ.

A tree 60 to 80 feet high; young branches slender, deciduously scurfily stellate-pubescent, the bark rather pale. *Leaves* thinly coriaceous, oblong-lanceolate, or oblanceolate, more or less bluntly acuminate, sometimes caudate, the base cuneate; both surfaces glabrous, the midrib on the upper puberulous; main nerves 8 to 12 pairs, rather prominent beneath; length 3 to 4 in., breadth ·8 to 1·3 in., petiole ·4 to ·5 in. *Panicles* axillary and extra-axillary, cymose, crowded near the ends of the branches, 1 to 2 in. long, minutely pale tomentose as are the ovate-lanceolate calyx-lobes. *Flowers* ·4 in. long. *Petals* narrowly oblong, obtuse, glabrous. *Stamens* 15, anthers ovate and slightly apiculate. *Ovary* minutely tomentose; stigma conical. *Ripe fruit* ·3 in. in diam., globose; the style persistent, minutely tomentose, quite free from the calyx; the two accrescent calyx-lobes oblong-oblanceolate, obtuse, obscurely 5-nerved, 2·75 in. long and ·75 in. broad; minor lobes unequal, lanceolate-acuminate, the largest about ·85 in. long.

Perak: King's Collector, Wray; a common tree. Pangkore: Curtis.

The nearest ally of this is *Vatica Bantamensis*, Benth. and Hook.; but that has rather larger and more coriaceous leaves which are perfectly glabrous; larger flowers with petals scaly externally and a more scurfy inflorescence; moreover, the whole of the accrescent calyx-lobes of its fruit are more coriaceous and the minor lobes are blunter.

Plate 181. *Vatica Perakensis*, King. 1, flowering branch; 2 and 3, ripe fruits with their wings; 4, ripe fruit with all the calyx-lobes removed: *of natural size;* 5, calyx opened up; 5*a*, petal: *slightly enlarged;* 6, stamens; 7, pistils with vertical section of ovary: *much enlarged.*

PLATE 182A.

VATICA NITENS, King in Journ. As. Soc. Bengal, for 1893, *pt.* 2, *p.* 104.

A tree 40 to 50 feet high: young branches and petioles densely covered with coarse deciduous scaly stellate tomentum, ultimately cinereous. *Leaves* coriaceous, narrowly oblong, slightly and bluntly acuminate, slightly narrowed to the rounded base; both surfaces, but especially the upper, shining glabrous, finely reticulate, the base on the lower sparsely scaly-tomentose when young; main nerves 18 to 20 pairs, spreading, prominent on the lower surface: length 7 to 10 in., greatest breadth 2 in.; petiole ·5 in., stout. *Ripe fruit* sub-globular, crowned by the persistent style, ·5 in. in diam., adnate for half its length to the calyx; the two large wings of the calyx oblong, slightly oblanceolate, obtuse, 2·5 to 3 in. long and ·8 to ·9 in. broad, the 3 shorter wings ovate-acuminate, ·8 in. long; all boldly 5-nerved and shining.

Penang: Curtis, No. 1404.

This fine species is known only by Mr. Curtis' imperfect specimens. It is very distinct, being at once recognisable amongst the Indian species of *Vatica* by the size of its leaves and calyx-wings.

PLATE 182A. *Vataca nitens*, King. 1, fruiting branch; 2, fruit with the calyx-lobes removed: *of natural size.*

PLATE 182B.

VATICA LOWII, King in Journ. As. Soc. Bengal, for 1893. *pt.* 2, *p.* 103.

A tree 60 to 80 feet high: young branches, petioles, inflorescence and calyx densely rusty scurfy-tomentose with stellate hair intermixed, the branches ultimately glabrous and with dark bark. *Leaves* coriaceous, oblong, sub-acute, the base rounded; both surfaces glabrous, the midrib puberulous on the upper; main nerves 13 to 15 pairs, spreading, slightly prominent beneath; length 2·5 to 3·5 in., breadth 1 to 1·5 in., petiole ·3 to ·5 in. *Panicles* axillary and terminal, much crowded towards the ends of the branches; ·75 to 1·5 in. long. *Flowers* ·25 in. long. *Calyx-lobes* 5, oblong or lanceolate, unequal, oblique. *Petals* 5, narrowly oblong, obtuse, almost glabrous. *Stamens* short, unequal-sided, apiculate. *Ovary* depressed-globose, tomentose, style capitate. *Ripe fruit* globular, ·25 in. in diam., deciduously rufus-scurfy; the style persistent, quite free from the calyx; two large calyx-wings narrowly oblong, sub-acute, scarcely narrowed at the base, 5-nerved, 2·25 to 3 in. long, and ·6 in. broad; the three smaller lobes sub-equal, about ·5 or ·6 in. long, lanceolate, sub-acute.

Perak: Scortechini, No. 2108; King's Collector, No. 7496.

This species is closely allied to *V. Maingayi*, Dyer; but has smaller flowers, and rather larger leaves with considerably longer petioles.

PLATE 128B. *Vatica Lowii*, King. 1, flowering branch; 2 fruiting branch: *of natural size;* 3, flower; 4, flower a little older and with the petals removed; 5 and 6, petals; 7, stamen; 8, pistil: *enlarged;* 9, section of ovary: *much enlarged.*

PLATE 183A.

VATICA CINEREA, King in Journ. As. Soc. Bengal, for 1893, *pt.* 2, *p.* 104.

A tree about 40 feet high; young branches rufescent-puberulous at the very tips, otherwise glabrous and cinereous. *Leaves* thinly coriaceous, ovate-oblong to ovate-lanceolate, sub-acute, the base rounded or sub-cuneate; both surfaces glabrous, finely

reticulate when dry; main nerves 6 to 8 pairs, spreading, faint; length 2·25 to 3·5 in., breadth ·75 to 1·5 in., petiole ·3 to ·5 in. *Panicles* mostly axillary, spreading, rusty scurfy-tomentose, 1·25 to 3 in. long. *Flowers* ·45 in. long. *Calyx-lobes* sub-equal, lanceolate or oblong, sub-acute, tomentose on both surfaces. *Petals* oblong-lanceolate, sub-acute, the half of the outer surface which is outside in æstivation pubescent, otherwise glabrous. *Stamens* obtusely apiculate. *Ovary* depressed, minutely tomentose; stigma capitate. *Fruit* (not quite ripe) globular, umbonate, attached for half its length to the calyx. The two larger calyx-wings oblanceolate-oblong, obtuse or sub-acute, 5-nerved, flocculent-puberulous near the base when young, ultimately glabrous, 2 in. long and ·75 in. wide; the 3 smaller wings lanceolate, obtuse, ·5 in. long.

Langani: Curtis, Nos. 2797 and 2798. Kedah: Curtis, Nos. 2096 and 2514.

When dried, the leaves of this are of a dull gray colour—hence the specific name. Its fruit resembles that of the next species, but the leaves have fewer and less prominent nerves.

PLATE 183A. *Vatica cinerea*, King. 1, flowering branch; 2, young fruit; 3, mature fruit: *of natural size*; 4, flower dissected; 5, pistils with the calyx-lobes cut away; 6, stamens: *enlarged*.

PLATE 183B.

VATICA CURTISII, King in Journ. As. Soc. Bengal, for 1893, *pt.* 2, *p.* 105.

A tree about 40 feet high: young branches, petioles, inflorescence and calyx brownish scurfy-pubescent, ultimately glabrous. *Leaves* ovate-oblong, sub-acute, the base rounded or sub-cuneate, both surfaces quite glabrous, reticulate; main nerves 8 to 13 pairs, oblique, rather prominent beneath; length 3 to 5 in., breadth 1·3 to 2·5 in., petiole ·3 to ·45 in. *Racemes* axillary, few-flowered, 1 to 1·25 in. long. *Flowers* ·35 to ·45 in. long. *Calyx-lobes* unequal, the two longer narrowly oblong, obtuse; the three shorter lanceolate-acuminate. *Petals* elliptic, slightly oblique, blunt, glabrous except the pubescent edge which is external in the bud. *Ripe fruit* globular, ·3 in. in diam., adherent to the calyx for half its length, the larger calyx-lobes oblong-oblanceolate, usually obtuse, rarely sub-acute, 5-nerved, 1·75 to 2·5 in. long, and ·7 in. broad; the smaller wings ·4 to ·6 in. long.

Penang: Curtis, No. 1579.

PLATE 183B. *Vatica Curtisii*, King. 1, fruiting branch; 2, flowering branch with the leaves removed; 3, ripe fruit: *of natural size*; 4, flower from which the petals have been removed and of which the calyx-lobes have begun to grow; 5, petal; 6 and 7, stamens; 8, pistils; 9, section of ovaries: *enlarged*.

PLATE 184.

PENTACME MALAYANA, King in Journ. As. Soc. Bengal, for 1893, *pt.* 2, *p.* 107.

Nat. Ord. Dipterocarpeæ.

A tree 40 to 50 feet high; young branches rather stout, dark-coloured, glabrous. *Leaves* sub-coriaceous, rotund-ovate to broadly elliptic, the apex shortly and bluntly acuminate, the base rounded or slightly emarginate; both surfaces glabrous, pale when dry; main nerves 15 to 18 pairs, spreading, prominent on both surfaces; length 5 to 7 in., breadth 2·75 to 4·5 in., petiole ·75 to 1·1 in. *Panicles* axillary, lax, few-flowered, 2·5 to 5 in. long. *Flowers* ·75 in. long and about as much in diameter

when open, pedicelled. *Calyx-lobes* more or less broadly ovate, acuminate, minutely tomentose outside, imbricate, two being quite external. *Petals* three times as long as the calyx, elliptic, spreading, puberulous on one half outside, and glabrous on the other, quite glabrous inside. *Stamens* 15, equal, erect, the filaments short and broad; the anthers elongate, narrow, with 5 apical awns, one of which is deflexed and rather shorter and thicker than the other four. *Ovary* ovoid, sub-glabrous, much shorter than the filiform style, stigma minute. *Ripe fruit* ovate, apiculate, 1 in. long, glabrous; calyx-wings all enlarged and reticulate except at the base; the three outer narrowly oblong, obtuse, and narrowed to the concave base, 9-nerved, 4 to 4·5 in. long, and ·65 to ·75 in. broad; the two inner lobes much narrower and fewer-nerved, about 2·5 in. long, or even shorter.

Langkani; Curtis, No. 2095.

The petals of this species are spreading, and the flower has quite an unusual *facies* for the order. It is at once distinguished by its curiously 5-awned anthers. Four of these awns are the produced apices of the anther cells, the fifth (the thicker and deflected one) is a prolongation from the connective.

PLATE 184. *Pentacme malayana*, King. 1, leaf twig; 2, flower; 3, the same dissected; 4, ripe fruit with one of the three enlarged calyx-lobes removed: *of natural size;* 5 and 6, anthers; 7 pistil: *enlarged.*

SHOREA, Roxb.

Glabrous, mealy, or pubescent resinous trees. *Leaves* entire or sub-repand, pinnate-veined; stipules large, coriaceous and persistent, or minute and fugacious. *Flowers* in axillary or terminal, lax, cymose panicles; bracts persistent, caducous, or 0. *Sepals* ovate or lanceolate, imbricate, 3 being external and 2 internal. *Stamens* 15 or 20, or 30: anthers ovate or oblong, rarely linear; connective subulate-cuspidate, rarely inappendiculate; valves obtuse, rarely cuspidate, equal, or the outer slightly larger. *Ovary* 3-celled, cells 2-ovuled; style subulate, stigma entire or 3-toothed. *Fruit* with leathery, rarely with woody, pericarp, 1-celled, 1-seeded, closely surrounded by the bases of the persistent, usually accrescent, sepals, the 3 outer, or more rarely, all, and sometimes none, of which are developed into 7- to 10-veined reticulate membranous linear-oblong wings. *Cotyledons* fleshy, unequal, usually enclosing the superior radicle.

DISTRIB.—Tropical Asia and chiefly the Malayan Archipelago; species about 60.

PLATE 185A.

SHOREA CURTISII, Dyer MSS. in Herb. Kew.

A tree 100 to 150 feet high; young branches slender, at first minutely stellate-puberulous, ultimately dark-coloured and glabrous. *Leaves* coriaceous, oblong-lanceolate bluntly acuminate; the base sub-cuneate, or sometimes almost rounded; upper surface of young leaves minutely pubescent, of adults glabrescent or quite glabrous, the lower uniformly covered with very minute rufescent (young), or pale (adult) tomentum; main nerves 10 to 14 pairs, ascending, curving slightly, prominent beneath: length 3 to 4 in., breadth 1·2 to 1·4 in., petiole ·4 to ·6 in. *Panicles* axillary or terminal, 1·5 to 3 in. long; the rachis slender, glabrous. *Flowers* about ·3 in. long, in distichous secund rows of 4 or 5, on the short lateral branchlets, enveloped while

in bud by broad deciduous puberulous bracts. *Sepals* ovate, tomentose outside, glabrous inside, slightly unequal. *Petals* twice as long as the calyx, linear-oblong, obtuse, stellate-pubescent outside, glabrous inside. *Stamens* 15, in three rows; the filaments elongate, broad (those of the outer row longest); anthers short, ovoid-globose, not apiculate. *Ovary* elongated-ovoid, tomentose in the upper, glabrous in the lower half, *style* short, *stigma* small. *Ripe fruit* narrowly ovoid, apiculate, ·75 in. long, pale tomentose; *calyx-wings* all enlarged and membranous, free from the fruit; the three outer linear-oblong, 8-nerved, 2·25 in. long, and about ·5 in. broad; the two inner about 1 in. long, linear and with fewer nerves. King in Journ. As. Soc. Beng., for 1893, pt. 2, p. 111.

Penang: Curtis, Nos. 427, 1394 and 1395. Perak: King's Collector, No. 8143.

The vernacular name of this in Penang is *Maranti Tai*. The tomentum on the lower surface of the leaves is very minute and can be seen only by using a good lens.

PLATE 185A. *Shorea Curtisii*, King. 1, branch with inflorescence in bud; 2, ripe fruit; 3, ripe fruit with one of the larger wings removed: *of natural size*; 4, one of the ultimate branches of the inflorescence in bud showing the large distichous concave bracts; 5, one of the bracts separated; 6, flower-bud; 7, expanded flower: *enlarged* 8, flower-bud; 9, stamens: *much enlarged*.

PLATE 185B.

SHOREA RIDLEYANA, King in Journ. As. Soc. Bengal, for 1893, *pt.* 2, *p.* 115.

A tree 60 or 80 feet high; young branches slender, dark brown, lenticellate, nearly glabrous. *Leaves* ovate-lanceolate, shortly acuminate, the base rounded; both surfaces glabrous, the upper shining; main nerves 9 or 10 pairs, curved, spreading, thin but slightly prominent beneath; length 2·5 to 4 in., breadth 1·1 to 1·75 in.; petiole ·4 to ·5 in., rugulose. *Panicles* axillary and terminal, 1·5 to 2 in. long, densely stellate-puberulous. *Flowers* ·2 in. long, pedicellate. *Sepals* sub-equal, oblong, obtuse, tomentose outside, glabrous inside. *Petals* oblong, slightly oblique, obtuse, glabrous inside on the lower puberulous on the upper half. *Stamens* 15, sub equal, the filaments dilated in the lower half; anthers shorter than the filaments, ovate, the connective produced into an awn longer than the anther. *Ovary* ovoid-conical, minutely tomentose in the upper half. *Style* short, conical; stigma minute. *Fruit* (immature) ovoid, apiculate, minutely pale tomentose; *sepals* all enlarged, membranous, reticulate and concave at the base; the three outer linear-oblanceolate, obtuse, narrowed to the concave base, 5-nerved, 2 to 2·25 in. long and ·4 in. broad; the two inner of the same shape, but only 1-nerved, narrower and much shorter.

Perak: King's Collector, Nos. 3571 and 3617.

This a good deal resembles *S. Maxwelliana*, King; but its leaves have more nerves, its slightly oblique petals are not saccate at the base, its ovary is ovoid-conical and minutely tomentose with a short style; whereas in *S. Maxwelliana* the petals are saccate at the base, and the ovary is hemispheric with a long style.

PLATE 185B. *Shorea Ridleyana*, King. 1, branch with young fruit; 2, branch with flowers: *of natural size*; 3, sepal; 4, petal; 5, ovary: *enlarged*.

PLATE 186.

SHOREA KUNSTLERI, King in Journ. As. Soc. Bengal, for 1893, *pt.* 2, *p.* 116.

A tree 60 to 100 feet high; young branches slender, rusty-puberulous, their bark brown. *Leaves* coriaceous, elliptic, abruptly and shortly acuminate, the base rounded or slightly cuneate, both surfaces glabrous, the lower with a few stiff white hairs on the midrib and nerves; main nerves 6 to 8 pairs, curved, ascending, prominent on the lower surface; length 4 to 5 in., breadth 2 to 2·4 in., petiole ·5 to ·7 in. *Panicles* axillary and terminal, 4 to 6 in. long, lax, few-flowered, scaly-puberulous *Flowers* ·5 in. long, sub-sessile, 4 or 5 together on the short branches of the panicles, secund, bracteate; the bracts broadly ovate, puberulous. *Sepals* sub-equal, broadly ovate, acute, tomentose outside, the edges ciliate, glabrous inside. *Petals* linear-oblong, obtuse; the bases obliquely expanded, sericeous externally, glabrous internally. *Stamens* 15, sub-equal; the filaments longer than the anthers, flattened; anthers ovate, short, the connective terminated by a curved awn much longer than the stamen. *Ovary* elongate-conic, puberulous, style short. *Ripe fruit* broadly ovoid, tapering into a cone and crowned by part of the style, adpressed pale tomentose. *Sepals* membranous, reticulate; the three larger narrowly oblong, obtuse, tapering to the concave non-reticulate base, 9-nerved, 3·5 in. long and ·7 in. broad; the two inner 2 in. long, linear, 3-nerved.

Perak: King's Collector, Nos. 3474 and 3705.

This species is allied to *S. bracteolata*, Dyer, but its leaves have fewer nerves, smaller flowers, narrower petals, and a short style.

PLATE 186. *Shorea Kunstleri*, King. 1, flowering branch; 2, ripe fruit; 3, ripe fruit with the three outer accrescent calyx-wings removed; 4, outer accrescent calyx-wing; 5, inner accrescent calyx-wing; 6, ripe fruit; 7, section of ripe fruit: *of natural size;* 8, calyx, ovary and style; 9, petals and stamens: *enlarged;* 10, stamens: *much enlarged.*

PLATE 187A.

SHOREA CILIATA, King in Journ. As. Soc. Bengal, for 1893, *pt.* 2, *p.* 118.

A medium-sized tree; young branches slender, dark-coloured, deciduously hoary-puberulous. *Leaves* coriaceous, lanceolate or oblong-lanceolate, acuminate, the base cuneate; both surfaces glabrous, minutely reticulate, the lower whitish when young, pale brown when dry; main nerves 5 to 9 pairs, ascending, curved, shining on the lower surface; length 2·5 to 3·5 in., breadth ·8 to 1·5 in., petiole ·75 to ·9 in. *Panicles* 2 to 2·5 in. long, axillary and terminal, little-branched, few-flowered, hoary. *Flowers* ·5 in. long. *Sepals* ovoid-deltoid, obtuse, outside tomentose, inside glabrous. *Petals* three times as long as the sepals, narrowly oblong, obtuse, slightly expanded at the base, adpressed-sericeous outside, glabrescent inside. *Stamens* 30, in fascicles of 3, unequal, the shorter with undilated filaments, the longer with filaments dilated in the lower half; all with the connective produced into an apical process crowned by 3 to 5 spreading ciliæ. *Ovary* ovoid-conic, sericeous, with a short glabrous style. *Fruit* (immature) ovoid, apiculate, pale-tomentose, ·5 in. long; accrescent sepals membranous, reticulate; the three outer narrowly oblong, reticulate, 7-nerved; the two inner 2 in.

long, and ·3 in. broad, narrowed to above the concave base; the two inner 1 in. long, linear-lanceolate, few-nerved.

Penang: Curtis, No. 1578.

Known only by Curtis' specimens, and readily recognisable by its beautifully ciliate-crested anthers.

PLATE 187A. *Shorea ciliata*, King. 1, flowering branch; 2, fruiting branch; *of natural size;* 3 & 4, sepals; 5 and 6, petals; 7 and 8, anthers; 9, ovary; 10, section of same: *enlarged.*

PLATE 187B.

HOPEA CURTISII, King in Journ. As. Soc. Bengal, for 1893, *pt.* 2. *p.* 124.

Nat. Ord. Dipterocarpeæ.

A tree 50 to 60 feet high; young branches slender, dark-coloured, lenticellate, almost glabrous. *Leaves* coriaceous, broadly ovate to ovate-oblong, shortly acuminate or acute, the base sometimes slightly unequal-sided, rounded, rarely sub-cuneate; both surfaces glabrous, the upper slightly puberulous on the midrib near the base, the lower with several hairy glands at the base, the midrib sparsely and minutely stellate-puberulous; main nerves 10 to 13 pairs, curving, ascending, prominent beneath; length 3·5 to 4·5 in., breadth 1·75 to 2·5 in.; petiole ·4 in., puberulous when young. *Panicles* axillary and terminal, lax, few-flowered. *Flowers* about ·2 in. long, pedicelled. *Sepals* broadly ovate, blunt, concave, tomentose outside, glabrous inside; the inner two rather smaller and more glabrous than the others. *Petals* oblong, oblique, falcate, obtuse, partially tomentose outside, glabrous inside. *Stamens* 10, the filaments short, dilated; anthers ovate, short, the connective with an apical awn longer than the anther. *Ovary* broadly ovate, puberulous at the truncate apex, otherwise glabrous, style short. *Ripe fruit* ovoid-globular, apiculate, pale striate, ·35 in. long; outer two sepals accrescent, narrowly-oblong, reticulate, membranous, obscurely 7- to 8-nerved, obtuse, slightly narrowed to the concave smooth base, 1·75 to 2·5 in long and from ·35 to ·6 in. broad; the three inner non-accrescent sepals about as long as the fruit.

Penang: Curtis No. 1562. Perak: King's Collector, 8161.

PLATE 187B. *Hopea Curtisii*, King. 1, fruiting branch; 2, nearly ripe fruit: *of natural size.*

PLATE 188.

SHOREA THISELTONI, King in Journ. As. Soc. Bengal, for 1893, *pt.*, 2, *p.* 122.

A tree 60 to 80 feet high; young branches rather stout, the bark dark-coloured and lenticellate, but covered at first by a pale-grey, deciduous pellicle. *Leaves* coriaceous, elliptic-oblong to elliptic, rarely oblong, sometimes slightly obovate, sub-acute, slightly narrowed to the rounded base; both surfaces glabrous, the lower when very young sparsely lepidote, puberulous especially on the midrib and nerves, brown when dry: main nerves 8 to 11 pairs, ascending, slightly curved, bold and prominent on the under surface like the midrib; length 5 to 7 in., breadth 2·25 to 3·25 in.; petiole ·6 to ·8 in, stout. *Panicles* axillary and terminal, 2 to 3 in. long, velvety, the flowers rather crowded, apparently ebracteolate. *Flowers* sessile, ·5 or ·6 in. long. *Sepals* ovate, sub-acute, unequal; the 3 outer tomentose outside, glabrous inside; the 2 inner smaller, nearly glabrous, the edges ciliate. *Petals* much longer than the

sepals, linear-oblong, obtuse, expanded at the base, glabrous, except one-half of the outer surface which is adpressed-pubescent. *Stamens* 15, in 3 rows, the filaments of all dilated, unequal; the anthers shortly ovate, each with a short apical appendage from the connective. *Ovary* narrowly conical, tomentose, tapering into the short glabrous style, stigma minute. *Ripe fruit* narrowly ovoid, apiculate, minutely pale-tomentose, substriate, 1·2 in. long, and ·6 in. in diam., the pericarp thick and woody. *Persistent sepals* with much thickened concave woody bases, forming a cup embracing the lower half of the fruit, the apices of the outer three prolonged into membranous linear-oblong sub-obtuse wings, one of them exceeding the fruit and sometimes 1·5 in. long; one of the inner sepals shortly winged, the other often broad obtuse and not winged.

Perak: common King's Collector.

In this plant the fruit is much larger than is usual in the genus, and its pericarp is hard and thick. The bases of the sepals are greatly thickened and concave, and they form a cup which embraces closely, but does not adhere to, the lower half of the fruit, the apices of some of them being winged as above described. In these respects the species resembles certain other Malayan species of *Shorea*, e.g., *S. Martiniana* Scheff., *S. scaberrima*, and *S. stenoptera*, Burck. Judging from the leaf-specimens on which Miquel founded his *Hopea Singkawang*, that plant must be a close ally of this. A specimen (flower only) collected by H. O. Forbes in Sumatra (Herb. No. 2952) must also be closely allied to this. It differs however by its conspicuously bracteolate inflorescence. Beccari's Nos. 2681 and 3507, which form the types of Heim's species *S. brachyptera*, are also allied to this.

PLATE 188. *Shorea Thiseltoni*, King. 1, flowering branch; 2, branch with young fruit; 3, ripe fruits; 4, ripe fruit removed from the accrescent calyx: *of natural size*; 5, flower-bud; 6, calyx, ovary, and style; 7, petal; 8, young fruit; 9 to 13, accrescent sepals of young fruit; 14, group of stamens, showing one of each of the three rows: *enlarged*; 15 & 16, stamens: *much enlarged*.

PLATE 189A.

HOPEA INTERMEDIA, King in Journ. As. Soc. Bengal, for 1893, *pt.*, 2, *p.* 126.

A tree 60 to 80 feet high; young branches rather dark-coloured, puberulous. *Leaves* coriaceous, ovate to ovate-lanceolate, caudate-acuminate, the base cuneate, both surfaces glabrous; main nerves numerous, faint; length 2·5 to 3 in., breadth 1 to 1·5 in.; petiole ·35 to ·6 in., slender, puberulous but finally glabrous. *Panicles* as in *H. Mengarawan*, the flowers pedicellate. *Sepals* sub-equal; the two outer ovate, acuminate; the three inner broader and more obtuse, all resinous outside, glabrous and smooth inside. *Petals* twice as long as the sepals, narrowly oblong, obtuse, falcate, densely sericeous externally, glabrous within. *Stamens* 12; the filaments dilated, shorter than the anthers; the anthers short, crowned by a straight awn from the connective longer than the stamen. *Ovary* hour-glass shaped; style short, stigma small. *Ripe fruit* ovoid, apiculate, ·3 to ·5 in. long, pale, striate; the two outer sepals accrescent, narrowly oblong-obtuse, narrowed to the base, reticulate, obscurely 5- to 7-nerved, 1·25 to 1·75 in. long and ·25 in. broad; the inner three sepals not accrescent, not longer than the fruit, and closely embracing it.

Penang: Curtis, No. 425 and 1398. Perak: King's Collector, No. 3709.

PLATE 189A. *Hopea intermedia*, King. 1, flowering branch; 2, young fruit; 3, mature fruit: *of natural size*; 4, flower-bud; 5, flower; 6, calyx cut open to show ovary; 7, petal with three stamens at its base; 8, ovary: *enlarged*; 9, three stamens: *much enlarged*.

PLATE 189B.

RETINODENDRON KUNSTLERI, King in Journ. As. Soc. Bengal, for 1893, *pt.* 2 *p.* 129.

Nat. Ord. Dipterocarpeæ.

A tree 20 to 50 feet high, sometimes a shrub; young branches, slender, deciduously stellate-puberulous. *Leaves* thinly coriaceous, elliptic-oblong to oblong-lanceolate, sometimes slightly obovate, sub-acute or shortly and bluntly acuminate; the base cuneate, rarely rounded; upper surface glabrous, the midrib and nerves pubescent; the lower quite glabrous; main nerves 10 to 13 pairs, spreading, slightly prominent beneath: length 2·25 to 4·5 in., breadth 1·25 to 1·75 in., petiole ·25 to ·4 in. *Racemes* axillary, 1 to 1·5 in. long, sparsely scaly. *Flowers* ·4 in. long. *Calyx-lobes* ovate-lanceolate, puberulous. *Petals* oblong-elliptic, oblique, obtuse, puberulous outside. *Anthers* sub-sessile, each with a stout apiculus as long as itself. *Ovary* puberulous, stigma capitate. *Ripe fruit* globular, with a long curved apical beak, glabrous, about ·25 in. in diam. *Calyx-lobes* all accrescent, sub-equal, oblong, tapering slightly to the sub-obtuse apex, the base slightly auricled, thickly membranous, glabrous, 3-nerved, the longest about 1·3 in. long and ·35 in. broad, loosely surrounding, and longer than, the fruit.

Perak: Scortechini, Wray, King's Collector; very common at low elevations.

In this species all the five calyx-lobes are accrescent and of nearly equal size. They are quite free from the ripe fruit, round which they form a loose semi-inflated investiture. Its nearest ally is *Vatica bancana*, Scheffer (= *Retinodendron bancanum*).

PLATE 189B. *Retinodendron Kunstleri*, King. 1, flowering branch; 2, ripe fruits; 3, a ripe fruit with the accrescent calyx-lobes removed; 4, accrescent calyx-lobe: *of natural size;* 5, calyx, ovaries and style; 6, petal; 7, ovary and style; 8, anthers: *enlarged.*

PLATE 190.

RETINODENDRON SCORTECHINII, King in Journ. As. Soc. Bengal, for 1893, *pt.* 2, *p.* 128.

A tall tree; young branches rather stout, densely furfuraceous-pubescent. *Leaves* coriaceous, oblong, tapering to the sub-acute apex; the base slightly narrowed, rounded: both surfaces glabrous; main nerves 14 to 18 pairs, spreading, curving, prominent on the lower, sub-depressed on the upper surface when dry, the transverse venation bold: length 7 to 10 in., breadth 2·3 to 3·25 in., petiole ·6 to ·75 in. *Panicles* crowded towards the apices of the branches, mostly axillary, 2 to 2·5 in. long, the rachises brownish flocculent stellate-tomentose, as is the calyx externally. *Flowers* ·6 in. long. *Calyx-lobes* 5, ovate. *Petals* 5, thick, oblong, blunt, puberulous externally, glabrous within. *Anthers* 15, elliptic, apiculate, the filaments very short. *Ovary* broadly ovoid from a truncate base, minutely tomentose, stigma clavate. *Ripe fruit* sub-globular, sub-rugose, vertically grooved, minutely rufous-scurfy, about ·75 in. in diam., laxly embraced in the lower half by the broadly ovate, membranous, many-nerved, reticulate, sub-equal calyx-lobes.

Perak: Scortechini, Nos. 1940 and 1942.

The calyx-lobes are nearly equal in size, quite free from the fruit, much shorter, and they embrace only its lower half. This species is allied to *Retinodendron Rassak*, Korth. (Nat. Gesch. Ned. Ind. 56, t. 8), but has broader leaves and much more condensed panicles than that species.

PLATE 190. *Retinodendron Scortechinii*, King. 1, flowering branch; 2, branch with ripe fruit: *of natural size;* 3, calyx; 4 & 5, petals; 6 & 7, stamens; 8, ovary, style, and stigma; 9, section of ovary: *enlarged.*

BALANOCARPUS, Beddome.

Nat. Ord. Dipterocarpeæ.

Glabrous or puberulous, rarely scabrid, resinous trees, with inconspicuous fugaceous stipules. *Leaves* entire, coriaceous or membranous, penni-nerved. *Flowers* secund, sessile or shortly pedicelled. *Sepals* distinct or united at the base, imbricated, two quite external to the others; in fruit sub-equal, only slightly enlarged, woody, thickened, and forming a 5-lobed cup round the base of (but rarely enveloping) the fruit, not adnate to it and never expanding into wings. *Petals* elliptic, obliquely acuminate, the apices slightly inflexed in bud or not inflexed at all. *Stamens* 15, attached to the bases of the petals, in 3 rows, or 10 in 2 rows, sub-equal, the filaments much dilated at the base, the connective prolonged into a straight apical awn longer than the ovate anther. *Torus* flat. *Ovary* 3-celled, cells 2-ovuled, ovules collateral. *Style* short. *Stigma* minute, entire. *Fruit* oblong or sub-globose, apiculate; the pericarp ligneous or sub-ligneous. *Seed* solitary, erect; cotyledons fleshy, plano-concave, the larger 2- or 3-lobed, or entire; the radicle prominent. Distrib.—Southern Peninsular India, Malaya;—probably 12 species.

PLATE 191A.

BALANOCARPUS CURTISII, King in Journ. As. Soc. Bengal, for 1893, *pt.* 2, *p.* 131.

A tree 20 to 30 feet high; young brances slender, the bark dark-coloured, puberulous. *Leaves* membranous, ovate-lanceolate, bluntly caudate-acuminate, the base slightly cuneate; both surfaces glabrous, dull; main nerves 8 to 10 pairs, spreading, faint and scarcely more prominent than the secondary nerves; length 2 to 2·5 in., breadth ·75 to 1·15 in., petiole ·1 to ·15 in. *Panicles* axillary and terminal, shorter than the leaves, glabrescent, lax, each with a few 3- to 5-flowered spreading branches. *Flowers* secund, shortly pedicelled, ·15 in. long. *Sepals* distinct, sub-equal, thick, rotund-ovate very obtuse, puberulous outside, glabrous inside, the edges slightly ciliate. *Petals* elliptic, obliquely shortly and bluntly acuminate, glabrescent inside, partly puberulous and partly glabrous outside. *Stamens* 15, in 3 rows, sub-equal; the filaments slightly longer than the anthers, dilated: anthers broadly elliptic, truncate, the connective produced into an apical awn longer than the stamen. *Ovary* cylindric, truncate, glabrous, the style short and stigma minute. *Fruit* smooth, globular, apiculate, crowned by the sub-sessile discoid stigma, enveloped by, but not adherent to, the slightly thickened sepals, ·25 to ·3 in. in diam. (calyx included).

Penang: Curtis, No. 1406. Perak: King's Collector, Nos. 3171, 3294, 6543; Wray, No. 2860.

PLATE 191A. *Balanocarpus Curtisii*, King. 1, branch with flowers and flower-buds; 2, twig with ripe fruit: *of natural size*; 3, flower bud; 4, petals opened up showing the stamens *in situ*; 5, ovary; 6, section of ovary: *enlarged*; 7, stamens: *much enlarged.*

PLATE 191B.

BALANOCARPUS PENANGIANUS, King in Journ. As. Soc. Bengal, for 1890, *pt.* 2, *p.* 131.

A tree 40 to 50 feet high; young branches slender, dark-coloured, lenticellate, slightly puberulous at the very tips. *Leaves* coriaceous, ovate-lanceolate or ovate-acuminate, often caudate-acuminate, the base slightly cuneate or almost rounded, the

edges slightly undulate, both surfaces glabrous; main nerves 7 to 8 pairs, spreading and curving upwards, not prominent on either surface; length 1·75 to 4 in., breadth ·8 to 1·6 in., petiole ·25 to ·4 in. *Panicles* axillary and terminal, hoary-pubescent, many-flowered; the flowers secund, 7 to 9 on each lateral branchlet, pedicelled, ·2 to ·25 in. long. *Sepals* sub-equal, broadly ovate, sub-acute, yellowish-pulverulent, puberulous externally, glabrous internally. *Petals* oblong, obtuse, twisted and with the apices reflexed in æstivation, spreading when expanded, minutely yellowish-pulverulent, tomentose outside, glabrous inside. *Stamens* 15, sub-equal; apical awn curved, longer than the anther. *Ovary* ovoid, narrowing upwards into the style, stigma minute. *Fruit* ovoid, very slightly apiculate, striate, pale pubescent, about ·6 in. long and ·3 in. in diam., the persistent calyx covering the lower fourth of the fruit, sub-glabrous, thickened and concave at the base; the teeth deltoid, spreading. *Richetia penangiana*, Heim in Bull. Soc. Linn. Paris, 1891, p. 980.

Penang: on Government Hill, at an elevation of about 1,000 feet, Curtis, Nos. 1429 and 1393; Hullett, No. 188; King's Collector, No. 1534. Perak: King's Collector, Nos. 3333, 3707.

The leaves of this species, although larger, resemble those of *B. Curtisii*: but the fruits of the two are quite different. One of Mr. Curtis' specimens, (No. 429 communicated from Kew), forms the type of a new genus called *Richetia*, which M. Heim has founded (l. c. p., 975, also in his "Recherches sur les Dipterocarpacées" p. 50), without having seen its flowers. I have retained for this M. Heim's specific name, while referring it to Beddome's older genus. The vernacular name of the species is *Dammar Etam*.

PLATE 191B. *Balanocarpus penanginus*, King. 1, flowering branch; 2, fruiting branch: *of natural size*; 3, flower bud: *enlarged;* 4, calyx and pistil; 5, petal and stamens: *much enlarged;* 6 and 7, stamens; 8, ovary; 9, section of ovary: *very much enlarged.*

PLATE 192.

BALANOCARPUS MAXIMUS, King in Journ. As. Soc. Bengal, for 1890, *pt.* 2, *p.* 133.

A tree 60 to 80 feet high, all parts except the inflorescence glabrous, young branches rather stout; the bark, loose, papery, lenticellate, pale. *Leaves* thinly coriaceous, oblong to elliptic-oblong, sub-acute, slightly narrowed to the rounded base; main nerves 7 to 9 pairs, slightly prominent beneath, the transverse veins slightly prominent when dry; length 5 to 7 in., breadth 2 to 2·5 in., petiole ·5 to ·6 in. *Panicles* axillary or terminal, about half as long as the leaves, few-flowered, minutely tomentose. *Flowers* subsessile, ·6 or ·7 in. long. *Sepals* broadly ovate, the outer two tomentose the inner three more or less glabrous externally, all glabrous internally, the inner two with ciliate margins. *Petals* much longer than the sepals, narrowly oblong, the apex erose, expanded and concave at the base, adpressed-pubescent outside and towards the apex inside, otherwise glabrous. *Stamens* 10, in two rows; anthers with a deflexed terminal appendage from the connective. *Ovary* elongate, narrowly conical, sericeous. *Style* rather short, glabrous, stigma small. *Ripe fruit* cylindrical, tapering to each end but most to the apiculate apex; pericarp woody, striate, sub-glabrous, pale-brown when dry, 1·75 to 2·25 in. long, and ·6 or ·7 in. in diam. *Persistent sepals* fibrous, forming a toothed cup about ·5 in. deep and embracing the base of the fruit.

Perak: King's Collector, Nos. 7987 and 8006.

The flowers of this fine species do not exactly answer to Beddome's diagnosis of the genus *Balanocarpus*, inasmuch as they have 10 instead of 15 stamens, and neither of the cotyledons is lobed. In other respects the flowers and fruit agree perfectly.

PLATE 192. *Balanocarpus maximus*, King. 1, flowering branch; 2, ripe fruit: *of natural size;* 3, flower-bud; 4 petal; 5 to 9, the sepals; 10 and 11, anthers; 12, ovary: *all enlarged.*

PLATE 193.

BALANOCARPUS HEMSLEYANUS, King in Journ. As. Soc. Bengal, for 1893, *pt.* 2, *p.* 134.

A tree 50 to 100 feet high; young branches rather stout, rough, minutely lenticellate, puberulous. *Leaves* coriaceous, elliptic-oblong, sometimes slightly obovate, shortly cuspidate, slightly narrowed to the rounded or sub-emarginate base: upper surface glabrous except the minutely tomentose midrib; the lower scabrid from minute rigid stellately hairy tubercles which are most abundant on the stout midrib and nerves: main nerves 15 to 20 pairs, oblique, parallel, very prominent on the lower, obsolete on the upper, surface; length 7 to 12 in., breadth 3·25 to 5 in.; petiole ·6 to ·9 in., scabrid-pubescent. *Panicles* axillary or terminal, 3 to 7 in. long, scurfy stellate-pubescent; flowers ·6 in. long, rather crowded on the short lateral branchlets. *Sepals* sub-equal, broadly ovate, acute, yellowish-tomentose externally, glabrous internally. *Petals* twice as long as the sepals, or longer, elliptic, oblique, obtuse, glabrous except a broad adpressed-sericeous band externally. *Stamens* 15, in bunches of three: the filaments dilated, unequal, longer than the shortly ovate anthers; apical connectival appendage deflexed, curved, longer than the anther. *Ovary* elongated-conic, minutely tomentose, tapering into the sparsely puberulous style; stigma small. *Ripe fruit* narrowly ovoid, apiculate, pale brownish-tomentose, 1·25 to 1·5 in. long and ·75 to 1 in. in diam. *Persistent sepals* nearly equal; their bases thickened, woody, pubescent, and concave, forming an irregularly 5-toothed cup which embraces the lower half of the fruit. *Shorea Hemsleyana*, King MSS. in Herb. Calc.

Penang: Curtis, No. 2512. Perak: King's Collector, Nos. 5431, 6670, and 7562. Scortechini, No. 1653.

This is an altogether anomalous species. It has leaves like several of the scabrid species of *Shorea*, such as *S. eximia* and *S. leprosula*. Its flowers are also more like those of *Shorea* than *Balanocarpus;* but its fruit is essentially that of the latter genus, in which, not without hesitation, I include it.

PLATE 193. *Balanocarpus Hemsleyanus*, King. 1, flowering branch; 2, branch with ripe fruit: *of natural size;* 3, calyx and pistil; 4, a group of stamens; 5, a petal with group of stamens at its base; 6, petal from a bud; 7, ovary, style and stigma; 8, vertical section of the same: *much enlarged.*

PACHYNOCARPUS, Hook. fil.

Nat. Ord. Dipterocarpeæ.

Resinous trees with the leaves and flowers of *Vatica*, but with sometimes only ten stamens. *Fruit* ovoid-globose, umbonate at the apex, 1-celled, 1-seeded, the pericarp densely coriaceous, splitting vertically. *Calyx* with five equal segments, at first almost free from the fruit, but the tube gradually accrescent, much thickened and adnate to the fruit, and finally embracing the whole of it except the apex. *Seed* pendulous, testa thin and adherent to the endocarp, cotyledons very thick and fleshy.

Dr. Burck (in Ann. Jard. Bot. Buitenzorg) expands the definition of the genus *Vatica* so as to include not only the closely allied *Synaptea*, but also the genera *Isauxis* W. A., *Retinodendron*, Korth., and *Pachynocarpus*, Hook. fil. To the union of *Synaptea* with *Vatica* I see no objection; for the whole difference between the two consists in perfect freedom of the fruit in *Vatica* from the enlarged calyx, whereas in *Synaptea* there is a slight adhesion to the calyx at the very base. But for the inclusion of *Pachynocarpus* I see no sufficient justification; for in this genus the calyx does not expand into membranous wings, but forms a dense fibrous cover for the fruit, which it tightly embraces, and to which it is quite adnate. As regards *Isauxis* and *Retinodendron*, they appear to me to be undistinguishable from each other by any but trivial marks; but they differ sufficiently in calyx from *Vatica* to be treated as a genus under the older name *Retinodendron*.

PLATE 194.

PACHYNOCARPUS STAPFIANUS, King in Journ. As. Soc. Bengal, for 1890, *pt.* 2. *p.* 136.

A tree 80 to 100 feet high; young branches rather stout, scaly-pubescent at first, ultimately glabrous. *Leaves* coriaceous, broadly elliptic or obovate-elliptic, the apex rounded, slightly narrowed to the rounded or subcuneate base: upper surface glabrous, shining, the lower paler, minutely and sparsely scurfy-puberulous on the midrib and nerves; main nerves 10 to 13 pairs, oblique, prominent on the lower, depressed on the upper, surface; length 5 to 8 in., breadth 2·75 to 4·5 in., petiole ·65 to 1 in. *Flowers* unknown. *Ripe fruit* almost solitary, 2·5 to 3 in. long, on a woody raceme, globular, slightly apiculate, 1·25 in. diam., closely invested by the gamosepalous, 5-toothed, thickened, woody, rugose, glaberulous calyx.

Perak: King's Collector, Nos. 5932 and 6132.

This very distinct species was first recognised as a *Pachynocarpus* by Dr. O. Stapf, of the Kew Herbarium, after whom I have named it. Its flowers are as yet unknown, but it is readily identified by its leaves.

PLATE 194. *Pachynocarpus Stapfianus*, King. Fruiting branch: *of natural size.*

PLATE 195.

ARISTOLOCHIA CURTISII, n. sp. King.

Nat. Ord. Aristolochiaceæ.

A woody climber 10 to 15 feet long; stem slender, glabrous. *Leaves* sub-coriaceous, alternate, cleft to within an inch of the base into three sub-equal lobes; the central rather longer than the two lateral lobes, oblong-oblanceolate, acuminate, 3-nerved; the two lateral subfalcate, obliquely obovate-oblong, very obtuse, 2-nerved, the venation of all three transverse; length of the side lobes 3·5 to 4·5 in., breadth at apex 1·25 to 1·5 in., the middle lobe 1 in. longer, but not so broad; petioles 2·5 in. long, slender. *Racemes* 1 or 2 from an axil, about 2 in. long, with numerous sub-horizontal amplexicaul cordate more or less rose-coloured bracts ·5 in. long. *Flowers* few, about 1·5 to 2 in. long, the perianth of a beautiful dark-blue colour, springing from the apex of the narrowly cylindric slightly clavate ovary, its lower part expanded into a narrowly ovoid

tube ·5 to ·65 in. long, containing the staminal column, then constricted into a short cylindric tube, and terminated by a sub-sagittate terminal lobe about 1 in. long. *Staminal column* short, with six broad fleshy lobes beneath which are the six broad sub-orbicular 2-celled anthers. *Stigmatic* lobes 6, small, triangular, their apices projecting above the staminal column. *Ovary* longitudinally striate, about ·25 in. long. *Fruit* unknown.

Penang: King's Collector No. 1453. Curtis, No. 330.

This beautiful species appears to have been collected only once. I have dedicated it to Mr. C. Curtis, who has in recent years done so much for the exploration of the rich flora of Penang.

PLATE 195. *Aristolochia Curtisii*, King. 1, flowering branch: *of natural size;* 2, staminal column; 3, two anthers; 4, ovary: *all enlarged.*

PLATE 196.

PRAINEA, King.

Nat. Ord. Urticaceæ. Tribe Conocephaleæ.

A powerful climber. *Flowers* diœceous, closely packed in globose heads with numerous peltate scales intermixed. MALE FLOWER with tubular, obtusely 4-toothed perianth; *stamen* solitary, the anther ovate, the filament short, thick, erect; pistillode 0. FEMALE FLOWER larger than the male, the perianth tubular-clavate, thickened towards the apex, the mouth minute. *Ovary* and *style* included, free; *style* terminal, deeply 2-fid; *ovule* solitary, erect, orthotropous. *Fruit* ovoid, rather fleshy, the perianth persistent and united with the pericarp, the endocarp membranous. *Seed* exalbuminous; cotyledons fleshy, plano-convex, equal; radicle minute, straight, superior.

This genus, which was first described in Hooker's Flora of Brit. India, vol. V, p. 546, resembles *Parartocarpus* in having only a single stamen in its male flowers, but differs in having a perianth, the flowers of *Parartocarpus* having none. The erect ovule of this constitutes, however, a more important distinction, and brings it into the tribe *Conocephaleæ*, rather than into *Artocarpeæ*.

Prainea scandens, King in Hook. fil. Fl. Br. Ind. V, 546. Glabrous; the young branches thin, cylindric, sparsely lenticellate. *Leaves* alternate, petiolate, oblong-ovate or oblanceolate, shortly cuspidate, entire, cuneate at the base. Receptacles axillary, solitary, pedicellate, the male ·5 in. in diam., the female 1·5 to 2 in. in diam. *Seeds* ovoid.

Perak; King's Collector, Nos. 3549 and 3693: in dense forests at elevations of under 1,000 feet: not common.

A fine climber from 50 to 100 feet long, the main stem 12 to 15 inches in diameter. Only a few flowers on each female receptacle become fertilised and produce fruit; the abortive flowers are dry, clavate, puberulous, and persistent. Between the flowers are interspersed numerous long-pedicelled, peltate, puberulous scales. The ripe fruit measures rather more than an inch in length, the ripe seed rather more than half-an-inch.

PLATE 196. *Prainea scandens*, King. 1, branch bearing one male receptacle; 2 and 3, female receptacles (from another plant): *of natural size*; 4, single female flower opened up to show the ovary and style; 5, ovary with its bifid style; 6, the same with the arms of the style separated; 7, female flower after fertilisation; 8, vertical section of the same, showing fertilised ovary, the style arms having shrivelled; 9, ripe fruit; 10, vertical section of a ripe seed, showing the plano-convex cotyledons; 11, the flat face of a cotyledon, showing the position of the radicle (r); 12, peltate scales from the female receptacle; 13, a male flower opened up to show the 4-toothed perianth and the single stamen; 14, peltate scale from male receptacle; 15, the same seen from above. *Nos. 4 to 15 are enlarged.*

PLATE 197.

Hullettia, King.

Nat. Ord. Urticaceæ; Tribe Conocephaleæ.

Diœcious shrubs with alternate entire penni-nerved leaves with small stipules. *Flowers* 10 to 12, sunk in cavities of axillary pedunculate open funnel-shaped 3-4-lobed ebracteolate receptacles. Male flowers: *Perianths* oblong, tubular, connate with each other below and with the receptacle; the apices free, 2-lobed or 2 toothed: *stamens* 2, the anthers ovate, erect, the filaments connate in a column; pistillode 0. Female flowers: *perianth* tubular-clavate, the apex umbonate and with a small vertical opening. *Ovary* free, clavate; *style* short, central, included, stigma small: *ovule* solitary, erect, orthotropous. *Fruiting receptacle* sub-globose, on lobed fleshy receptacles enclosing 1 to 6 one-seeded fruits with membranous pericarps and the unfertilized flowers. *Seed* erect, sub-globose or flattened, exalbuminous; the cotyledons fleshy, sub-equal, plano-convex; radicle minute, straight, lying between the cotyledons near their apices.

The general affinities of this genus of *Urticaceæ*, which was first described in Hooker's Flora of British India, Vol. V, 547, are with the tribe *Artocarpeæ*, from which, however, the erect ovule excludes it. In this character, as also in its undivided style, it agrees with the *Conocephaleæ*; and, amongst the genera of that tribe, it comes nearest to *Coussapoa.*

Hullettia dumosa, King in Hook. fil. Fl. Br. Ind. V, 547. Glabrous, the young branches pubescent. *Leaves* elongated-obovate or oblong, shortly cuspidate, the base narrowed, 6 to 12 in. long and 2·5 to 3·5 broad; the petioles stout, ·5 to 1 in. long. *Stipules* ovate, acute. *Receptacles* of male flowers ·25 in. in diam., those of the female flowers sub-globose or sub-pyriform, 1 to 2 in. in diam., all with short stout peduncles.

Perak: King's Collector No. 3959; Scortechini, without number.

Another species of this genus (*H. Griffithiana*, King) occurs in Tenasserim. It was first collected by Helfer and is his No. 4676—1 (Kew Distribution). The specimen just quoted was described by Kurz under the name *Dorstenia Griffithii* (Flora of Burma, II 462). But it does not agree with the characters of that genus. Excellent specimens of Helfer's plant have recently been collected near Mergui in Tenasserim by Mr. R. L. Proudlock, Curator of the Botanic Garden, Calcutta.

Plate 197. *Hullettia dumosa*, King. 1, branch bearing a mature female receptacle; 2, male receptacle, *seen from outside* (from another specimen); 3, immature female receptacle; 4 and 5, the same cut obliquely; 6, transverse slice of a female receptacle, showing the arrangement of the perianths and ovaries; 7, vertical section of a mature sub-globose receptacle containing only one seed; 8, vertical section of a mature lobed receptacle containing several seeds; 9, a seed; 10, vertical section of a seed, showing the plano-convex cotyledons and the minute superior radicle (r): *all of natural size*; 11, female flower, showing the tubular perianth cut open and the clavate ovary; 12, vertical section of a male receptacle, showing the anthers of three flowers; 13 and 14, male flowers with one side of the perianth cut away; 15, 16, and 17, the diantherous column of the male flower, seen from different points: *all enlarged.*

PLATES 198 AND 199.

Hemiorchis Pantlingii, King n. sp.,

Nat. Ord. Scitamineae.

Herbaceous; rhizome 12 to 18 in. long, branching, sparsely clothed with short fibres. *Leafy stem* distinct from the flowering one and produced after it, 15 to 20 in. long; *leaves* ovate-lanceolate, tapering to each end, sheathing at the base, 6 to 14 in. long and

2 to 4·5 in. broad. *Flowering stem* stout, 4 to 8 in. long, leafless, but with 4 to 6 blunt spathaceous bracts. *Flowers* spicate. *Calyx* tubular, pubescent, membranous, with three short subequal sub-acute lobes shorter than the corolla-tube. *Corolla* in two whorls of 3 each; the outer whorl pinkish, with a dorsal ovate segment and two lateral shorter and narrower segments, all subacute; inner whorl yellowish, shorter than the outer, the two lateral segments broad, obovate, emarginate, the middle lobe rhomboidal, concave with a central thick ridge from base to apex; at the base a transverse recurved process, and at the sides of the base two purple divergent fleshy processes (staminodes). *Fertile stamen* incurved, shorter than the inner whorl of the corolla; the filament thick and fleshy; anther broadly elliptic, emarginate at base and apex, 2-celled, with longitudinal lateral dehiscence. *Ovary* inferior, obliquely and narrowly ellipsoid, striate, 1-celled; placentas 3, parietal; style filiform, lying in a groove on the face of the filament and between the anther-cells; *stigma* projecting slightly above the apex of the anther, minute, cup-shaped. *Capsule* fusiform, 1·25 in long, 8- to 10- ribbed, pubescent, crowned by the withered segments of the perianth. *Seeds* broadly ovoid, ·25 in. long, with a short white fleshy arillus.

Sikkim Himalaya; growing in sand by the sides of streams from 800 to 3,500 feet. R. Pantling.

This interesting genus was founded by Kurz in the Journal of the Asiatic Society of Bengal in the volume for 1873, pt. 2, p. 108, t. VIII. Kurz regarded the perianth as consisting of a tubular calyx in a single whorl, and of a corolla in two whorls. But he did not observe (at least he did not describe) the two staminodes at the base of the odd lobe of the inner whorl of the corolla which complete the symmetry of the staminal whorl. As a fact these staminodes do not appear to be well developed in the only species which he knew, viz. *H. Burmanica*. In the plant now figured and described, these are most distinct; and I venture to think that their existence invalidates the theory of the flower under which the lateral lobes of the inner whorl of the corolla are in this genus regarded as staminodes.

PLATE 198. *Hemiorchis Pantlingii*, King. 1, rhizome, showing the relation of the bud of the leafy-stem to the old flowering stem; 2 outline of one of the largest leaves: *of natural size*; 3 & 4, leafy-stem: *reduced in size*.

PLATE 199. *Hemiorchis Pantlingii*, King. 5, rhizome and flowering scape: *of natural size*; 6, front view of flower; 7, side view of flower; 8, stamen, and middle lobe of inner whorl of corolla with the staminodes at its base; 9, base of middle lobe cut off at its junction with the tube; 10, part of ovary, tube of corolla and fertile stamen; 11, fertile anther with stigmas projecting from its apex; 12, ripe fruit; 13, a seed; 14, section of the same: *all enlarged*.

PLATE 200.

MILULA, *nov. gen.* Prain.

Nat. Ord. Liliaceae.

Tribus XII. ALLIEAE (*definitione parum ampliata*—bracteae 1—∞, flores rarissime spicati).

Subtribus 1.* *Miluleae.* (Sub-trib. nova proxima *Euallieis* anteponenda). *Bulbus tunicatus; spica in scapo simplici aphyllo terminalis. Bractea membranacea subspica* 1, *bracteolae* 0; *perianthium gamophyllum; androecium regulare. Capsula loculicide dehiscens.*

MILULA gen. nov. Prain in Sc. Mem. Med. Off. Army India. Part IX, t. 1. *Bulbus* tunicatus; *folia* liguliformia; *inflorescentia* spicata, bractea solitaria membranacea obtecta; *perianthium* gamophyllum 6-partitum, lobis rotundatis; *stamina* breviter epiphylla 6, petalis opposita; *ovarium* syncarpium 3-loculare, stylo simplice filiformi, ovula in loculis

singulis 2; capsula loculicide dehiscens, seminibus 2—3; *testa* corrugata et minutissime punctulata.

"MILULA SPICATA Prain, l. c. *Herba* bulbo elongato dimidio inferiore squamis (foliorum "veterum reliquiis) fibrosis vestito radicibus numerosis; *foliis* lineari-lanceolatis scapum "fistulosum bulbo duplo longiorem aequantibus excedentibusue; *spica* cylindrica bractea "basali spathacea ovato-acuminata inclusa, floribus viridi-rubescentibus parvulis plurimis "campanulatis, segmentis perianthii aequalibus margine undulato-fimbriatis; staminibus "in seriebus duabus exterioribus 3 carpellis alternantibus filamentis dimidio inferiore "expansis petaloideis, interioribus 3 carpellis oppositis paullo brevioribus filamentis "prorsus filiformibus, antheribus versatilibus omnibus perfectis; *ovario* subgloboso ovulis "ad angulum loculi interiorem parum supra basin affixis; *capsula* globosa ovulis in "loculo quoque semper 1 nonnunquam ambobus abortis; seminibus nigris.

"In HIMALAYA ORIENTALI: Chumbi, apud Do-tho, *Kingii mercenar.!*

"Bulbus 'prasinus' 4—7 cm. longus; squamæ fibrosæ $2\frac{1}{2}$—$3\frac{1}{2}$ cm.; radices "4—5 cm.; folia viridia 10—15 cm. longa, hæc $\frac{1}{3}$—$\frac{1}{2}$ cm. lata; scapus viridis liber "6—9 cm. longus, $\frac{1}{4}$—$\frac{1}{3}$ cm. crassus; spica 2—5 cm. longa, 1 cm. diam.; bractea 3 cm. "longa hæc 2 cm. lata; flosculi $2\frac{1}{2}$ mm. lati perianthio $3\frac{1}{2}$ mm. filamentis 4—5 mm. "longis; ovarium $1\frac{1}{2}$ mm. diam. stylo 2 mm. longo stigmate minimo; capsula 3 mm. "lata tenuis; semina $2\frac{1}{2}$ mm. longa $1\frac{1}{2}$ mm. diam."

"This plant is one of the most interesting which the botanical investigation of the Eastern Himalaya, conducted during the past twenty years on behalf of the Government of Bengal by the Superintendent of the Royal Botanic Garden, Calcutta, has revealed to science. It was obtained by one of the native collectors of that garden in Chumbi, the valley which lies immediately to the east of Sikkim. Politically, this valley is Tibetan; geographically, it forms part of the Himalayan region, since the stream that drains it finds its way southwards through Bhutan and Assam to the Brahmaputra. Its Flora, however, indicates that, though so near to Sikkim, it enjoys a comparatively dry climate. This is due to the fact that, in place of lying open, as does the basin of the Tista (which practically constitutes Sikkim) to the moisture-laden currents that sweep up from the sea of Bengal to precipitate on the Sikkim Himalaya the heavy rainfall which characterises this area, the Chumbi Valley has a narrow southern outlet, and the lofty ridges which enclose it practically deprive these currents of their moisture ere they reach the depression beyond.

"The facies of this singular plant, which bears out to some extent the comparative dryness of its habitat, is so completely that of an *Allium* that at first sight one feels inclined, in spite of its spicate inflorescence and its solitary bract, to treat it as the type of a somewhat aberrant section in that comprehensive genus. Both characters, repugnant though they be to our generic conception of *Allium*, might be looked upon as incidental. Already *Allium* includes species with heads of sessile florets, while in some other genera the passage from a head to a spike is of the simplest;* the difference, moreover, between one bract and two, among plants like the *Allieæ*, where the bracteal variation is admittedly 2—∞, is no more than arithmetical. But when we find these characters associated with such apparently essential ones as a distinctly gamophyllous perianth and a decidedly 2-seriate androecium, it becomes at least inadvisable to further expand the limits of a genus already so unwieldy as *Allium*. A secondary reason for excluding the plant from *Allium* is that the specimens show no trace of the garlic odour so characteristic, even in dried examples, of most if not of all the species of that genus.

"The localisation of the genus does not appear to be difficult; an overwhelming majority of characters indicate its tribal position to be among the *Allieæ*, (tribe XII of *Liliaceæ* in Bentham and Hooker's *Genera Plantarum*). It its true that none of the *Allieæ* hitherto described have a spicate inflorescence or a solitary bract. But it must be remembered that both characters may be merely incidental; the main

* The genus *Acacia*, for example, amongst the *Leguminosæ*; *cfr.* Prain in Journal of the *Bombay Natl. Histy.* Society, V, 165 (1890).

point is that, like the other *Allieae*, the plant under review *is* bracteate under the inflorescence. The *Scilleæ*, with which it agrees in the single character of a spicate inflorescence, and whose facies it does not recall, have no involving bract. The secondary question of the subordinate position of the genus presents a little difficulty. Of the already recognised subtribes it clearly approaches most nearly the *Euallieæ;* and, if it must be located in a known subgroup, it is among these that it can with the least amount of dislocation be placed. The question really turns on the relative value, for purposes of classification, of characters derived from the inflorescence and from the individual florets. Already the *Euallieæ* include plants with a gamophyllous perianth and plants with 2-seriate filaments, so that the characters on which the generic rank of *Milula* largely depends favour the localisation of the genus in that subtribe. At the same time it must be recollected that, whether incidental or not, the characters of a spicate inflorescence and of a solitary bract are not shared by any other member of the *Allieae*, and it seems more natural as well as more convenient to treat *Milula* as typical of a new subtribe to be inserted among the *Allieæ* immediately before the *Euallieae*." *D. Prain in Scientific Memoirs by the Medical Officers of the Army of India Part 9, 1895.*

PLATE 200. *Milula spicata*, Prain.

1. Section of stem × $\frac{1}{1}$.
2. Flower × $\frac{3}{1}$.
3. Perianth laid open to show staminal insertion × $\frac{4}{1}$.
4. Stamen of outer series, from within and also sideways × $\frac{4}{1}$.
5. Stamen of inner series, from within and also sideways × $\frac{4}{1}$.
6. Ovary × $\frac{4}{1}$.
7. Vertical section of ovary showing an ovule × $\frac{4}{1}$.
8. Floral diagram, vertical.
9. Floral diagram, horizontal.
10. Ripe fruit, cut across × $\frac{4}{1}$.
11. Ripe fruit, seeds fallen, showing dehiscence × $\frac{4}{1}$.
12. Diagram showing dehiscence and position of seeds and of abortive ovules.
13. Seed × $\frac{4}{1}$.
14. Vertical section of seed showing embryo × $\frac{4}{1}$.

Figs. 1—9 are taken from flowers belonging to the specimen delineated; figs. 10—14 from fruits of a second specimen collected at the same time and place.

The specimen selected is the only one of the solitary gathering which shows two scapes; the others have put one.

H. P. & E. J. H.—Reg. No. 2868J—260—24.4.06.

INDEX.

ACONITUM *atrox*, Wall. 109
„ ferox, *Wall.* 109
„ „ sub-sp. moschata 109
„ „ „ palmata 111
„ „ „ propria 110
„ „ „ „ VAR. atrox . . 110
„ „ „ „ „ crassicaulis . 110
„ „ „ „ „ cymbiformis . 111
„ „ „ „ „ flavidiflora . 111
„ „ „ „ „ heterophylloides 110
„ „ „ „ „ laciniata . . 111
„ „ „ „ „ lancifida . . 111
„ „ „ „ „ laxiflora . . 110
„ „ „ „ „ leucantha . . 110
„ „ „ „ „ navicularis . . 111
„ „ „ „ „ spicata . . 110
„ gymnandrum, *Maxim.* 113
„ *Kufnetzoffii*, Reichb. 111
„ *lethale*, Griff. 109
„ luridum, *Hook. fil. & Th.* 112
„ *palmatum*, Don 109
„ *virosum*, Don 109
ACTINIDIA Miquelii, *King* 145
ALSODEIA, *Thouars* 122
„ capillata, *King* 126
„ cinerea, *King* 124
„ „ VAR. hirsutiflora, *King* . . . 125
„ comosa, *King* 127
„ condensa, *King* 126
„ *dasycaula*, Miq. 122
„ *echinocarpa*, Korth 127
„ floribunda, *King* 125
„ Hookeriana, *King* 123, 124
„ Kunstleriana, *King* 122
„ membranacea, *King* 122
„ *mollis*, Hook. fil. & Th. 125
„ Scortechinii, *King* 126
„ Wallichiana, *Hook. fil. & Th.* 123
„ Wrayi, *King* 124
Alytostylis, Hook. fil. 121
ARISTOLOCHIA Curtisii, *King* 161
ANEMONE brevistyla, *Franchet* 83
„ „ VAR. trichocarpa, P.B. . . 83
„ demissa, *Hook. fil. & Th.* 81
„ „ VAR. connectens 81
„ „ „ macrantha 81
„ „ „ monantha 82
„ „ „ umbellata 81
„ „ „ villosissima 81
„ elongata, *Don* 82
„ Falconeri, *T. Thoms.* 76
„ gelida, *Maxim.* 80
„ Griffithii, *Hook. fil. & Th.* 75
ANEMONE obtusiloba, *Don* 76
„ „ sub. sp. cœlestina 78
„ „ „ obtusiloba . . . 78
„ „ „ omalocarpella . . . 78
„ „ „ ovalifolia . . . 78
„ „ „ VAR. geocharis . . . 78
„ „ „ „ orthocaula . . 78
„ „ sub-sp. saxicola 78
„ „ „ trullifolia . . . 77
„ „ „ VAR. linearis . . . 77
„ „ „ „ rotundifolia . . 78
„ „ „ „ spatulata . . 77
„ rupestris, *Wall.* 79
„ „ VAR. lobata 80
„ „ „ pusilla 81
„ „ „ Wallichii 80
BALANOCARPUS, *Bedd.* 158
„ Curtisii, *King* 158
„ Hemsleyanus, *King* 160
„ maximus, *King* 159
„ penangianus, *King* 158
BERGSMIA, *Blume* 132
BERGSMIA ? *acuminata*, Miq. 132
„ *javanica*, Bl. 132
„ *Sumatrana*, Miq. 132
CALATHODES palmata, *Hook. fil. & Th.* 85
„ „ VAR. Anartema 86
„ „ „ appendiculata . . . 86
CALOPHYLLUM, *Linn.* 142
„ Prainianum, *King* 142
„ *pulcherrimum*, Wall 142
„ subsessile, *King* 142
„ *Teysmannii*, Miq. 142
CAPPARIS, *Linn.* 117
„ ambigua, *Kurz* 120
„ andamanica, *King* 119
„ cucurbitina, *King* 119
„ *erythrodasis*, Miq. 118
„ *Finlaysoniana*, Wall. 119
„ Gallatlyi, *King* 118
„ larutensis, *King* 118
„ *luzoniensis*, Turcz. 120
„ Scortechinii, *King* 118
„ *trinervia*, Hook. fil. & Th. 119
CLEMATIS acuminata, *Ham.* 74
„ „ sub-spec. Leschenaultiana . . 75
„ „ „ sikkimensis . . . 75
„ „ „ „ VAR. Andersoni 75
„ „ „ „ „ Clarkei . 75
„ „ „ „ „ Hookeri . 75
„ „ sub-spec. Wallichii . . . 75
„ „ „ yunnanensis . . 75
„ montana, *Ham.* 72

Clematis montana, var. anemoniflora 73
" " " chumbica 73
" " " fasciculiflora 73
" " " grandiflora 74
" " " incisa 73
" " " intermedia 74
" " " khasiana 74
" " " manipurensis 74
" " " præcox 73
" " " tonglensis 74
Cleome aspera, Kœnig 117
" Burmanni, W. & A. 117
" Hullettii, King 117
Cocculus Kunstleri, King 116
" macrocarpus, W. & A. 116
" pictinervis, Miers 116
Coptis Teeta, Wall. 89
" ospriocarpa, P. Brühl 89
Cratoxylon Maingayi, Dyer 138
Cyclea elegans, King 116
Dammar Etam 159
Delphinium, Tourn. 90
" *altissimum*, Hook. fil. & Th. . . . 102
" *altissimum*, Wall. 101
" " sub-spec. drepanocentra . . 101
" " " Wallichii . . 101
" " var. Nipalensis . . 101
" " " Phallutensis . . 101
" *Brunonianum*, " *densa* . . . 102
" *Carela*, Don 101
" cheilanthum, Linn. 99
" " sub-spec. Middendorffii . 100
" " " schizophylla . 100
" " " vera . . . 100
" *cœruleum*, Jacquem. 97
" *Davidi*, Franchet 97
" densiflorum, Duthie 102
" " var. platycentra . . . 103
" " " stenocentra . . . 103
" dictyocarpum, DC. 100
sub-spec. laxiflora . . 100
" " " propria . . 100
" Tibetica . . 100
" " var. glandulosa . . 100
" " " cinerea . . . 100
" grandiflorum, Linn. 97
" " var. bhutanica . . . 99
" " " chinensis . . . 98
" " " Davidii . . . 98
" " " kumaonensis . . 98
" " " kunawarensis . . 98
" " " latisecta . . . 98
" " " Linnæi . . . 98
" " " obtusifolia . . . 99
" " " paradoxa . . . 99
" " " Potanini . . . 98
" " " pubiflora . . . 98
" " " setchwanensis . . 98
" " " tenuicaulis . . . 98
Delphinium grandiflorum, var. tsangensis . . . 99
" incanum, Royle 96
" *kamaonense*, E. Huth 97
" *longipes*, Franchet 97
" pachycentrum, Hemsl. 107
" " sub-spec. Hemsleyi . . 108
" " " tsangensis . . 108
" " var. dasycarpa . . 108
" " " leiocarpa . . 108
" saniculæfolium, Boiss. 94
" " sub-spec. centeteroides 95
" " " vera . . 95
" " " var. aquilegifolia . . 95
" " " var. gilgitensis . 95
" " " var. kohatensis . 95
" " " var. kurramensis . 95
" " " var. refracta 95
" speciosum, M. Bieb 105
" " sub-sp. ranunculifolium, Brühl. 105
" " " var. brachycentra . 106
" " " " eriantha . . 106
" " " " katatricha . 107
" " " " lasiantha . . 107
" " " " marriensis . . 107
" " " " oinophylla . 107
" " " " pulverulenta . 107
" " " " thyrsantha . 106
" stapeliosmum, Brühl 102
" " var. khasiana . . . 102
" " " shanica . . . 102
" uncinatum, Hook. fil. & Th. 93
" " var. Aitchesoni . . . 94
" " " pseudo-vestita . . 94
" " " Vicaryi . . . 94
" viscosum, Hook. fil. & Th. 104
" " var. chrysotricha . . . 104
" " " ciliata 104
" " " connectens . . . 104
" " " gigantobractea . . . 104
Dillenia meliosmæfolia, Hook. fil. & Th. . . . 116
Diploclisia, Miers 116
Dipterocarpus *Dyeri*, Pierre 149
" *grandiflorus*, Blanco 148
" *Griffithii*, Miq. 148
" Kunstleri, King 148
" *retusus*, Bl. 149
" *trinervis*, Bl. 149
Dorstenia Griffithii, Kurz 163
Garcinia, Linn. 139
" andamanica, King 141
" *cornea*, Wall. 139
" *dulcis*, Kurz 141
" Kunstleri, King 140
" *linoceiroides*, T. Anders 140
" merguensis, Wight 141

Garcinia opaca, *King* . . . 139
„ *penangiana*, King . . . 140
„ *rostrata*, Hassk. . . . 141
„ *Villersiana*, Pierre . . . 141
„ Wrayi, *King* . . . 140
Gordonia imbricata, *King* . . . 148
„ Maingayi, *Dyer* . . . 147
Hemiorchis *burmanica*, Kurz . . . 164
„ Pantlingii, *King* . . . 163
Hopea Curtisii, *King* . . . 155
„ intermedia, *King* . . . 156
„ *Singkawang*, Miq. . . . 156
Hullettia, *King* . . . 163
„ dumosa, *King* . . . 163
„ *Griffithiana*, King . . . 163
Hydnocarpus, *Gaertn.* . . . 128
„ Curtisii, *King* . . . 129
„ cucurbitina, *King* . . . 129
„ *heterophyllus*, Bl. . . . 131
„ ilicifolia, *King* . . . 130
„ nana, *King* . . . 128
„ Wrayi, *King* . . . 130
Isauxis, W. & A. . . . 161
Isopteris penangiana, Wall. . . . 136
Kadsura pubescens, Miq. . . . 146
Kayea, *Wall.* . . . 143
Kayea Curtisii, *King* . . . 144
„ grandis, *King* . . . 143
„ Kunstleri, *King* . . . 143
„ Manii, *King* . . . 144
„ *nervosa*, T. And. . . . 144
„ *racemosa*, Planch. . . . 144
Maranti Tai . . . 153
Milula, *Prain* . . . 164
„ spicata, *Prain* . . . 165
Pachynocarpus, *Hook. fil.* . . . 160
„ Stapfianus, *King* . . . 161
Paeonia moutan, *Ait.* . . . 114
„ „ sub-spec. atava . . . 114
Parartocarpus, Baill . . . 162
Pentace Malayana, *King* . . . 151
Prainea, *King* . . . 162
„ scandens, *King* . . . 162
Prosthesia, Bl. . . . 122, 125
Prosthesia javanica, Bl. . . . 124
Pyrenaria Kunstleri, *King* . . . 146
„ Wrayii, *King* . . . 147
Ranunculus afghanicus, *Aitch. & Hemsl.* . . . 85
„ Aucheri, *Boiss* . . . 84
„ „ sub-spec. hariabensis . . . 85
„ „ „ elbrusensis . . . 84
„ „ „ typica . . . 84
„ „ „ var. Bungeana . . . 84
„ „ „ „ persica . . . 84
„ „ „ „ sikaramensis . . . 85
Retinodendron, *Korth.* . . . 161
„ *bancanum*, King . . . 157
„ Kunstleri, *King* . . . 157
„ *Rassak*, Korth. . . . 157
„ Scortechinii, *King* . . . 157
Richetia penangiana, Heim. . . . 159
Roydsia, *Roxb.* . . . 120
„ fasciculata, *King* . . . 121
„ *floribunda*, Planch. . . . 121
„ *parviflora*, Griff. . . . 121
„ Scortechinii, *King* . . . 120
Ryparia, Blume . . . 132
Ryparosa cæsia, *Bl.* . . . 133
„ fasciculata, *King* . . . 135
„ Kunstleri, *King* . . . 134
„ Kurzii, *King* . . . 133
„ Scortechinii, *King* . . . 134
„ Wrayi, *King* . . . 133
Shorea, *Roxb.* . . . 152
„ *brachyptera*, Heim. . . . 166
„ *bracteolata*, Dyer . . . 154
„ ciliata, *King* . . . 154
„ Curtisii, *Dyer* . . . 152
„ eximia, *Scheff.* . . . 160
„ *Hemsleyana*, King . . . 160
„ Kunstleri, *King* . . . 154
„ *leprosula*, Miq. . . . 160
„ Martiniana, *Scheffer* . . . 156
„ *Maxwelliana*, King . . . 153
„ Ridleyana, *King* . . . 153
„ *scaberrima*, Buerck . . . 156
„ *stenoptera*, Buerck . . . 156
„ Thiseltonii, *King* . . . 155
Synaptea, Griff. . . . 161
Taraktogenos, *Hassk.* . . . 131
„ Kunstleri, *King* . . . 131
Ternstrœmia Scortechinii, *King* . . . 145
Tetracera grandis, *King* . . . 115
Thalictrum cultratum, *Wall.* . . . 72
„ „ sub-spec. platycarpa . . . 72
„ „ „ tsangense . . . 72
„ „ „ vera . . . 72
Trigoniastrum hypoleucum, *Miq.* . . . 135
Trollius acaulis, *Lindl.* . . . 86
„ altaicus, *A. C. Meyer* . . . 86
„ asiaticus, *Linn.* . . . 86
„ europœus, *Linn.* . . . 86
„ laxus, *Salisb* . . . 86
„ lilacinus, *Bunge* . . . 86
„ pumilus, *Don* . . . 86
„ „ sub-spec. anemonifolia . . . 87
„ „ „ geraniifolia . . . 88
„ „ „ normalis . . . 88
„ „ „ var. bhotanica . . . 88
„ „ „ „ khasuensis . . . 88
„ „ „ „ ranunculoides . . . 88
„ „ „ „ sikkimensis . . . 88
„ „ „ „ tangutica . . . 88
„ „ „ „ yunnanensis . . . 88
Vatica, *Linn.* . . . 149
„ *bantamensis*, Benth. & Hook. fil. . . . 149
„ cinerea, *King* . . . 150
„ Curtisii, *King* . . . 151
„ Lowii, *King* . . . 150
„ *Maingayi*, Dyer . . . 150

VATICA perakensis, *King* 149
" nitens, *King* 150
WORMIA meliosmæfolia, *King* 115
Xanthochymus dulcis, Roxb. 141
XANTHOPHYLLUM, *Roxb.* 136
" *affine*, Korth. 137
" andamanicum, *King* 136
XANTHOPHYLLUM *eurynchum*, Miq. 137
" Griffithii, *Hook. fil.* 136
" Kunstleri, *King* 137
" *palembanicum*, Miq. 137
" pulchrum, *King* 138
" Scortechinii, *King* 138
" Wrayi, *King* 136

W. M. D'C.—Reg. No. 2898J of 1893-94—260—3.6.96.

INDEX.

[The names of the species described are in Roman characters, those of all others are in italics.]

ACANTHEPHIPPIUM striatum, *Lindl.* 22
AERIDES *ampullaceum*, Roxb. 50
„ *appendiculatum*, Wall. 51
„ *densiflorum*, Wall. 55
„ *latifolium*, Thwaites 39
„ *racemiferum*, Wall. 53
„ *ramosum*, Wall. 54
Androgyne, Griff. 19
Ania latifolia, Lindl. 24
Anoectochilus lanceolatus, Lindl. 60
„ *luteus*, Lindl. 60
Aporum (*Sect.*) 7
„ *indivisum*, Lindl. 7
„ *Leonis*, Lindl. 7
Ate (*Sect.*) 63
„ *acuminata*, Thwaites 67
Bolbodium (*Sect.*) 4
Bonatea benghalensis, Griff. 63
„ *herbacea*, Wall. MSS. 63
„ *punduana*, Lindl. 63
Broughtonia linearis, Wall. 28
BULBOPHYLLUM *Blepharistes*, Reichb. fil. 16
„ cuplepharum, *Reichb. fil.* 16
„ *Griffithianum*, Par. & Reichb. fil. 17
„ polyrhizon, *Lindl.* 15
„ *scabratum*, Reichb. fil. 18
„ *refractum*, Reichb. fil. 19
„ *tripudians*, Par. & Reichb. fil. 19
CALANTHE chloroleuca, *Lindl.* 31
„ *galeata*, Lindl. 31
„ herbacea, *Lindl.* 30
Callostylis rigida, Blume 22
CIRRHOPETALUM *andamanicum*, Kurz. 17
„ *Andersoni*, Kurz 17
„ Blepharistes, *Hook. fil.* 16
„ cœspitosum, *Wall.* 18
„ gamosepalum, *Griff.* 17
„ refractum, *Zoll.* 18
„ *tripudians*, Par. & Reichb. fil. 19
„ *Wallichii*, Lindl. 19
CLEISOSTOMA andamanicum, *Hook. fil.* 53
„ bicuspidatum, *Hook. fil.* 58
„ brevipes, *Hook. fil.* 55
Cleisostoma *callosum*, Reichb. fil. 57
„ *Dawsonianum*, Reichb. fil. 36
„ *lanatum*, Lindl. 48
„ *latifolium*, Lindl. 54
„ Mannii, *Reichb. fil.* 57
„ ramosum, *Hook. fil.* 54
„ spicatum, *Lindl.* 55
„ uteriferum, *Hook. fil.* 56
„ Wendlandorum, *Reichb. fil.?* 57
CŒLOGYNE *falcata*, T. Anders. MSS. 30
„ flavida, *Wall.* 28
„ *fimbriata*, Lindl. 28
„ *fuliginosa*, Lindl. 28
„ Kingii, *Hook. fil.* 25
„ longibracteata, *Hook. fil.* 26
„ *Manigayi*, Hook. fil. 26, 27
„ ovalis, *Lindl.* 28
„ *parviflora*, Lindl. 19
„ *pilosissima*, Planch 28
„ suaveolens, *Hook. fil.* 27
„ *undulata*, Wall. MSS. 27
„ ? uniflora, *Lindl.* 29
Coriifoliæ (*Sect.*) 3
Cristatæ (*Sect.*) 45
Cymbidium inconspicuum, Wall. 46
„ *longipetalum*, Herb. Calc. 35
Cyrtopera (*Sect.*) 32
„ *fusca*, Wight. 33
„ *Gardneri*, Thwaites 33
„ *laxiflora*, Gardn. MSS. 33
„ *macrobulbon*, Par. & Reichb. fil. 34
„ *mysorensis*, Lindl. 33
„ *nuda*, Reichb. fil. 33
„ *plicata*, Lindl. 33
„ *purpurea*, T. Anders. MSS. 33
DENDROBIUM *alpestre*, Royle 5
„ aurantiacum, *Reichb. fil.* 13
„ *aurantiacum*, Rolfe 14
„ candidum, *Wall.* 12
„ crocatum, *Hook. fil.* 9
„ *demissum*, Don. 19
„ denudans, *Don.* 4
„ eriæflorum, *Griff.* 5
„ *eulophotum*, Lindl. 7
„ *herbaceum*, Lindl. 6
„ *indivisum*, Blume 7
Dendrobium *ionopus*, Reichb. fil. 10, 11
„ *Jerdonianum*, Wight 12
„ Leonis, *Reichb. fil.* 7
„ *linguæforme*, Par. MSS. 6
„ *microbulbon*, A. Rich. 5
„ nutans, *Lindl.* 12, 8
„ pachyglossum, *Reichb. fil.* 8, 12
„ palpebræ, *Lindl.* 14
„ panduriferum, *Hook. fil.* 10
„ *panduriforme*, var. *serpens*, Hook. fil. 11
„ parcum, *Reichb. fil.* 6
„ pumilum, *Roxb.* 4
„ *polyrhizon*, Wall. 15
„ *quadrangulare*, Par. 4
„ serpens, *Hook fil.* 10
„ *sphegidoglossum*, Reichb. fil. 13
„ *strongylanthum*, Reichb. fil. 5
„ stuposum, *Lindl.* 13
„ tenuicaule, *Hook. fil.* 9
„ teres, *Lindl.* 7
„ tropæoliflorum, *Hook. fil.* 11
„ *villosulum*, Lindl. 12
„ Williamsoni, *Day & Reichb. fil.* 6
Dendrolirion (*Sect.*) 21
Dipodium plicatum, Ham. 33
„ *Roniayte*, Ham. 33
„ *scariosum*, Ham. 32
Distichophylla, (*Sect.*) 49
DORITIS Braceana, *Hook. fil.* 40
„ Wightii, *Benth.* 39
Epipactis carinata, Roxb. 63
Eubulbophyllum (*Sect.*) 15
Eucœlogyniæ (*Sect.*) 27
Eudendrobium *Sect.*) 12
EULOPHIA andamanensis, *Reichb. fil.* 34
„ *bicolor*, Dalz. 33
„ *bracteosa*, Lindl. 32
„ explanata, *Lindl.* 32
„ *fusca*, Blume 33
„ *fusca*, Wall. 34
„ *grandiflora*, Lindl. 32
„ macrobulbon, *Hook. fil.* 34
„ nuda, *Lindl.* 32, 34
„ „ var. Andersoni 33
„ „ var. macrantha 33
„ „ var. purpurea. 33

ERIA *Ania*, Reichb. fil. . . . 24
„ *barbata*, Reichb. fil. . . 22
„ clavicaulis, *Wall.* . . 21
„ discolor, *Lindl.* . . 21
„ *khasiana*, Lindl. . . . 21
„ *Lindleyana*, Griff. . . 20
„ obesa, *Lindl.* . . . 20
„ *pulchella*, Hook. fil. . 21, 22
Formosæ (Sect.) 6
Georchis foliosa, Lindl. . . . 61
„ *secundiflora*, Griff. . . 61
„ *vittata*, Lindl. . . . 61
GOODYERA foliosa, *Benth.* . . 61
„ vittata, *Benth.* . . 61
Gymnadenia Helferi, Reichb. fil. . 67
HABENARIA arietina, *Hook. fil.* . 64
„ digitata, *Lindl.* . . 63
„ *ensifolia*, Lindl. . . 65
„ *foliosa*, A. Rich. . . 64
„ *Galeandra*, Benth . 68
„ geniculata, *Don* . 65
„ Helferi, *Hook. fil.* . 67
„ *intermedia*, Don. . . 65
„ *janthe*, Benth. . . 68
„ *laciniata*, Dalz. . . 64
„ latilabris, *Hook. fil.* . 66
„ *pectinata*, Lindl. . . 64
„ *pectinata*, Don. . . 65
„ *stenantha*, Hook. fil. . 67
„ stenopetala, *Lindl.* . 64
„ „ var. polytricha 64
„ triflora, *Don?* . . 66
„ *trinerve*, Wight . . 63
HERPYSMA longicaulis, *Lindl.* . 59
Hologlossa (*Sect.*) . . . 66
Hymeneria (*Sect.*) . . . 20
Limatodes mishmensis, Lindl. & Paxt. 25
LIPARIS Gamblei, *Hook. fil.* . . 2
„ *Griffithii*, Ridley . . 3
„ plantaginea, *Lindl.* . . 3
„ *orbicularis*, Lodd. . . 3
„ *selligera*, Reichb. fil. . 3
LUISIA Grovesii, *Hook. fil.* . . 35
Malaxis acuminata, Don. . . 2
Micranthæ (Sect.) . . . 46
Micropera pallida, Lindl. . . 51
MICROSTYLIS *biloba*, Reichb. fil. . 2
„ *obliqua*, Par. MSS. . 2
„ Wallichii, *Lindl.* . 2
„ „ var. brachycheila . 2
„ „ var. omphaloides . 2
Mollifoliæ (*Sect.*) 2
Monochilus (*Sect.*) 60
NEPHELAPHYLLUM grandiflorum, *Hook. fil.* 23
OBERONIA orbicularis, *Hook. fil.* . 1
„ *pachyrachis*, Hook. fil. . 1
„ *phyllostachys*, Wall. MSS. . . . 1
ODONTOCHILUS flavus, *Benth.* . 60
„ lanceolatus, *Benth.* . 59
„ *luteus*, Benth. . . 60
Oeceocladus flexuosus, Lindl. . . 54
Orchis mysorensis, Heyne . . 64
PANISIA, *apiculata*, Lindl. . . 20
„ parviflora, *Lindl.* . . 19
„ *reflexa*, Lindl. . . 19
„ *uniflora*, Lindl. . . 30
Pedilonum (*Sect.*) . . . 9
PHAJUS mishmensis, *Reichb. fil.* . 25
PHALÆNOPSIS *Barrii*, King. MSS. 38
„ *cornu-cervi*, Reichb. fil. 38
„ Kunstleri, *Hook. fil.* . 38
„ Mannii, *Reichb fil.* . 37
„ *speciosa*, Reichb. fil. . 38
„ tetraspis, *Reichb. fil.* . 38
„ *Wightii*, Reichb. fil. . 39
Pholidota suaveolens, Lindl. . . 27
Phyllostachya (Sect.) . . . 67
Platanthera acuminata, Lindl. . 66
„ *geniculata*, Lindl. . 65
„ *latilabris*, Lindl. . 67
„ *marginata*, Wall. . 64
„ *Orchidis*, Wall. . 67
Platyglossa (*Sect.*) . . . 64
POGONIA carinata, *Lindl.* . . 62
„ *nobilis*, Scott MSS. . . 62
„ *plicata*, Lindl. . . 63
„ Scottii, *Reichb. fil.* . . 62
„ *No. 2, Griff.* . . . 62
Pomatocalpa spicatum, Kuhl & Hasselt. 57
Pteroceras (*Sect.*) 40
Racemosæ (*Sect.*) . . . 16, 18
Renanthera Jerdoni, Herb. Calc. . 37
SACCOLABIUM *ampullaceum*, Lindl. 50
„ *buccosum*, Reichb. fil. . . . 56
„ *carinatum*, *Griff.* . 52
„ *curvifolium*, Lindl. . 50
„ *densiflorum*, Lindl. . 55
„ distichum, *Lindl.* . 49
„ *flexuosum*, Lindl. . 54
„ gemmatum, *Lindl.* . 46
„ *gemminatum*, Hook. fil. . . . 46
„ inconspicuum, *Hook. fil.* . . . 46
„ lanatum, *Hook. fil.* . 48
„ *pallens*, Lindl. . . 50
„ penangianum, *Hook. fil.* . . 47
Saccolabium *racemiferum*, Lindl. . 53
„ *ramosum*, Lindl. . 54
„ *rubrum*, Lindl. . . 50
„ tenuicaule, *Hook. fil.* 49
„ trichromum, *Reichb. fil.* . . . 50
SARCANTHUS *affinis*, Wall. . . 53
„ appendiculatus, *Hook. fil.* 50
„ *densiflorus*, Par. & Reichb. fil. . . 55
„ insectifer, *Reichb. fil.* . 52
„ *latifolius*, T. Anders. MSS. . . . 56
„ oxyphyllus, *Wall.* . 52
„ pallidus, *Lindl.* . 53
„ *peninsularis*, Dalz. . 52
„ secundus, *Griff.* . . 51
„ *teretifolius*, Reichb. fil. 51
„ *tricolor*, Reichb. fil. . 53
SARCOCHILUS aureus, *Hook. fil.* . 42
„ Berkeleyi, *Reichb. fil.* 44
„ brachyglottis, *Hook. fil.* . . . 42
„ cladostachys, *Hook. fil.* 43
„ hirsutus, *Hook. fil.* . 44
„ muriculatus, *Hook. fil.* 40
„ stenoglottis, *Hook. fil.* . . . 41
Speciosæ (*Sect.*) 50
Stachyobium (*Sect.*) . . . 4
STAUROPSIS undulatus, *Benth.* . 36
„ *giganteus*, Benth. . 37
Strongyle (*Sect.*) . . . 7
TAINIA cordifolia, *Hook. fil.* . . 24
„ latifolia, *Benth.* . . 23
Thrixspermum Berkeleyi, Reichb. fil. 44
TRICHOGLOTTIS Dawsoniana, *Reichb. fil.* . . . 36
„ *fasciata*, Reichb. fil. 36
„ *quadricornuta*, Kurz 36
„ *retusa*, Blume . 36
Tropæolum pentaphyllum, Lamk. . 11
Tylostylis discolor, Hook. fil. . 22
„ *rigida*, Blume . . 22
Umbellatæ (*Sect.*) . . . 17
Vanda *alpina*, Lindl. . . . 45
„ cœrulescens, *Griff.* . . 37
„ *cristata*, Lindl. var. *pumila*. 45
„ „ var. B. . . 45
„ *Jerdoni*, Herb. Calc. . 37
„ *paniculata*, R. Br.? . . 53
„ pumila, *Hook. fil.* . . 45
Vanda undulata, Lindl. . . 37
Virgatæ (*Sect.*) 8
ZEUXINE goodyeroides, *Lindl.* . 60

[illegible] Hook. f.

Drawn by G. C. Dass.

LIPARIS GAMBLEI, Hook. f.

Lith by

Drawn by G. C. Dass.

LIPARIS PLANTAGINEA, Lindl.

Lith. by B. K. Roy

Drawn by G. C. Dass.

DENDROBIUM PUMILUM, Roxb.

Lith. by A. C. Mukerjei.

Drawn by G. C. Dass.

DENDROBIUM DENUDANS, Don

Lith. by Chitra Silpi Co.

Drawn by L. Singh.

Lith. by Chitra Silpi Co.

DENDROBIUM ERIÆFLORUM Griff.

Drawn by

DENDROBIUM PARCUM,

by G. C. Dass.

Lith. by Chitra Silpi Co.

DENDROBIUM WILLIAMSONI, Reichb. f.

Ann. Roy. Bot. Garden, Calcutta, Vol. 5, PLATE 10.

Lith. by Chitra Silpi Co.

DENDROBIUM LEONIS, Reichb. f.

Drawn by L. Singh.

Drawn by G. C. Dass.

Lith. by Chitra Silpi C°

DENDROBIUM TERES, Lindl.

Drawn by C. C. Dass.

Lith. by Chitra Silpi Co.

DENDROBIUM PACHYGLOSSUM, Par. and Reichb. f.

Drawn by G. P. Dass.

Lith by Chitra Silp: Co

DENDROBIUM TENUICAULE, Hook f.

Drawn by G. C. Dass.

DENDROBIUM CROCATUM, Hook. f.

Lith. by Chitra Silpi C°

Drawn by G. C. Dass

Lith by P. N. Sinha

DENDROBIUM PANDURIFERUM, Hook. f.

Lith. by P. N. Sinha.

DENDROBIUM PANDURIFERUM, Hook. f. var. SERPENS, Hook. f.

Drawn by G. C. Dass

DENDROBIUM TROPÆOLIFLORUM, Hook f.

Lith. by E. K. Roy

Drawn by L. Singh.

Lith. by B.K. Roy.

DENDROBIUM NUTANS, Lindl.

Drawn by L. Singh.

Lith. by B. K. Roy.

DENDROBIUM CANDIDUM, Wall.

Lith. by P. N. [illegible]

Drawn by G. C. Dass

DENDROBIUM STUPOSUM, Lindl.

DENDROBIUM AURANTIACUM, Reichb. f.

DENDROBIUM PALPEBRÆ, Lindl.

Drawn by G. C. Dass. (A)
and L. Singh. (B)

Lith. by P. N. Sinha

BULBOPHYLLUM POLYRHIZUM, Lindl.

Drawn by L. Singh.

Lith. by P. N. Sinha.

BULBOPHYLLUM EUBLEPHARUM, Reichb. f.

Drawn by G. C. Dass.

CIRRHOPETALUM BLEPHARISTES, Reichb. f.

Lith. by A. C. Mukerjei.

Drawn by G. C. Dass.

CIRRHOPETALUM GAMOSEPALUM, Griff.

Lith. by A. C. Mukerjei.

Drawn by L. Singh.

CIRRHOPETALUM CÆSPITOSUM, Wall.

Lith. by A. C. Mukerjei.

Drawn by G. C. Dass.

CIRRHOPETALUM REFRACTUM, Zoll.

Lith. by B. K. Roy.

Drawn by G. C. Dass

PANISEA PARVIFLORA, Lindl.

Drawn by L. Singh.

Lith. by B. K. Roy.

ERIA OBESA, Lindl.

Drawn by L. Singh.

ERIA CLAVICAULIS, Wall.

ACANTHEPHIPPIUM STRIATUM, Lindl.

NEPHELAPHYLLUM GRANDIFLORUM, Hook. f.

Drawn by G. C. Dass. Lith. by B. K. Roy.

TAINIA LATIFOLIA, Benth.

Drawn by G. C. Dass

Lith by B K Roy

TAINIA CORDIFOLIA, Hook. f.

Ann. Roy. Bot. Garden, Calcutta, Vol 5, PLATE 37.

Fr. Cathcart in Herb. Kew

Lith. by K. D. Chundra

PHAJUS MULMEINENSIS, Hook. f.

Drawn by G. C. Dass

Lith. by [illegible]

CŒLOGYNE KINGII, Hook.f.

Drawn by G. C. Dass.

CŒLOGYNE SUAVEOLENS, Hook f.

Lith by Chitra Silpi Co.

Drawn by L. Singh.

CŒLOGYNE ? UNIFLORA, Lindl.

Lith. by Chitra Silpi Co.

Drawn by G. C. Dass

CALANTHE HERBACEA, Lindl.

CALANTHE CHLOROLEUCA, Lindl

EULOPHIA EXPLANATA, Lindl.

Lith: by K. H. Das

Drawn by G. C. Dass.

EULOPHIA NUDA, Lindl.

Lith by Chitra Silpi Co.

Drawn by G. C. Dass

... Chitra Silpi Co.

EULOPHIA NUDA, Lindl. var. PURPUREA.

Lith. by R. K. Roy

EULOPHIA NUDA, [illegible]

Drawn by [illegible] Singh.

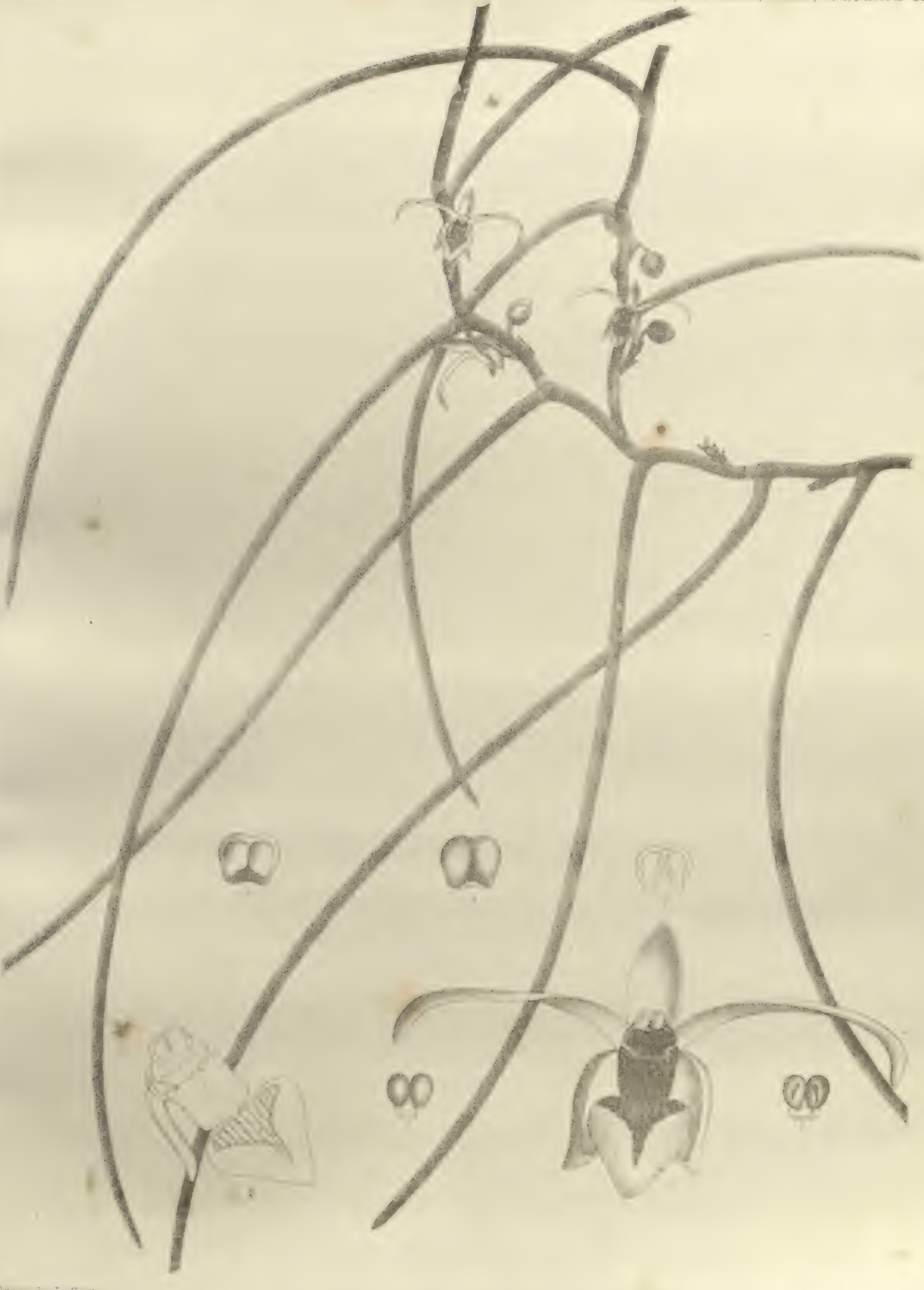
EULOPHIA MACROBULBON, Hook. f.

Lith. by B. K. Roy.

Drawn by G. C. Dass

EULOPHIA ANDAMANENSIS, Reichb. f.

Lith. by B. K. Roy



Drawn by L. Singh

LUISIA GROVESII, Hook. f.

Drawn by G. C. Dass.

TRICHOGLOTTIS DAWSONIANA, Reichb. f.

Lith. by Chitra Silpi ...

[illegible]

PHALÆNOPSIS MANNII, Reichb. f.

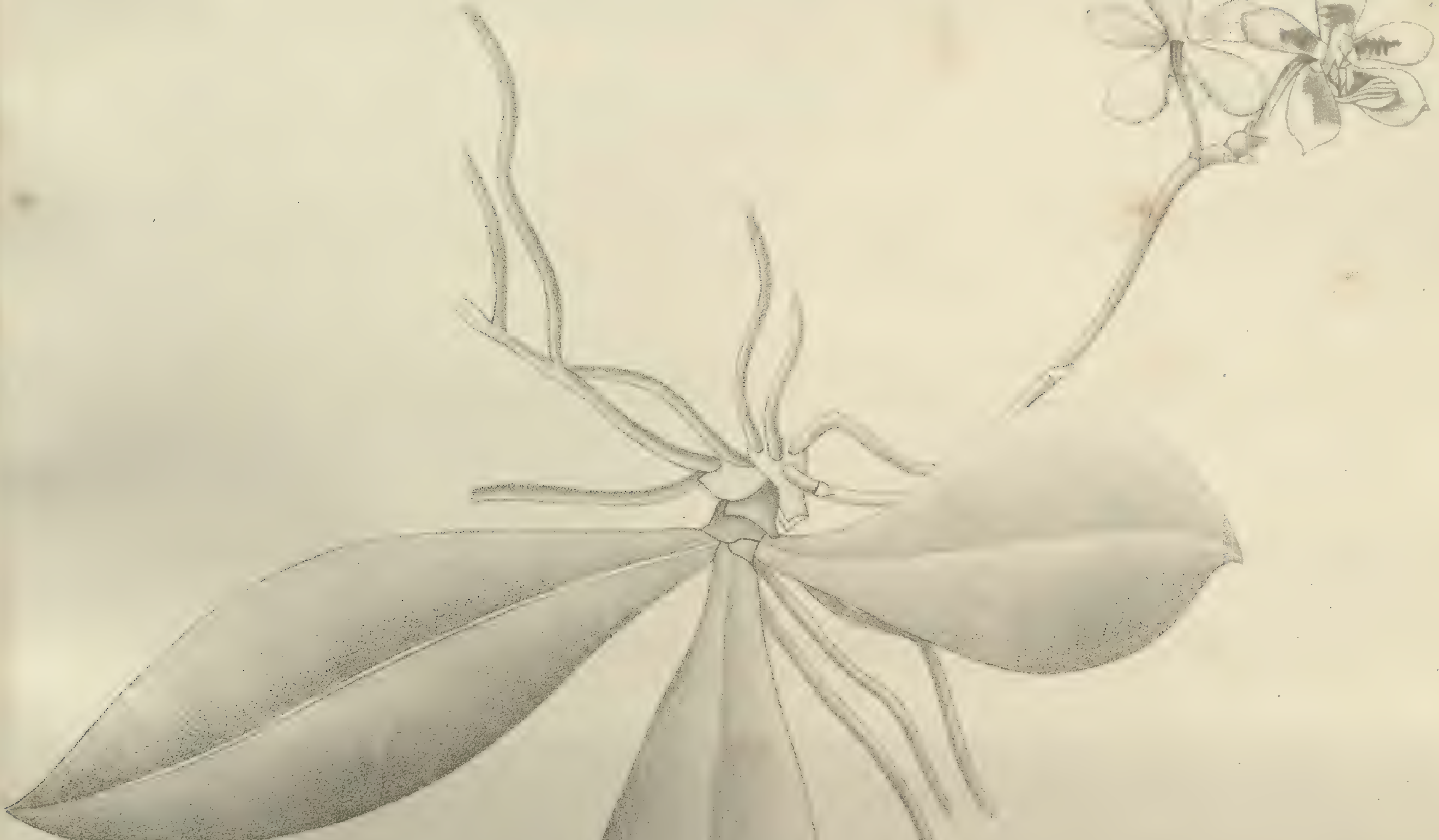
Lith. by A. C. Singha.

Drawn by G. C. Dass.

Drawn by ... Dass

Lith by ...

PHALÆNOPSIS TETRASPIS, Reichb. f.



Drawn by G. C. Dass; anal. by J. D. Hooker.

PHALÆNOPSIS KUNSTLERI, Hook. f.

Lith: by A. C. Singha.

Lith. by J. C. Chuckerbutty.

DORITIS WIGHTII, Benth.

[illegible] BRACEANA, Hook. f.

ith by J. C. Chuckerb

Drawn by [illegible] Dass, anal. by J. D. Hooker.

SARCOCHILUS MORICULATUS, Reichb. f.

Lith: by J. C. Chuckerbutty.

Drawn by G. C. [illegible]

SARCOCHILUS STENOGLOTTIS Hook f.

[illegible]

SARCOCHILUS AUREUS, Hook. f.

Lith: by J. C. Chuckerbutty.

Drawn by G. C. Dass; anal. by J. D. Hooker.

SARCOCHILUS HIRSUTUS, Hook f.

Lith. by Thuse Dagu Co.

Drawn by G. C. Dass.

VANDA PUMILA, Hook.f.

Drawn by L. Singh. Lith by P. N. Sinha.

SACCOLABIUM INCONSPICUUM, Hook. f.

Drawn by G. C. Dass; anal. by J. D. Hooker.

Lith. by P. N. Sinha.

SACCOLABIUM PENANGIANUM, Hook. f.

Drawn by L. Singh, and by J. D. Hooker. Lith: by P. N. Sinha.

SACCOLABIUM LANATUM, Hook. f.

SACCOLABIUM DISTICHUM, Lindl.

Drawn by [illegible]

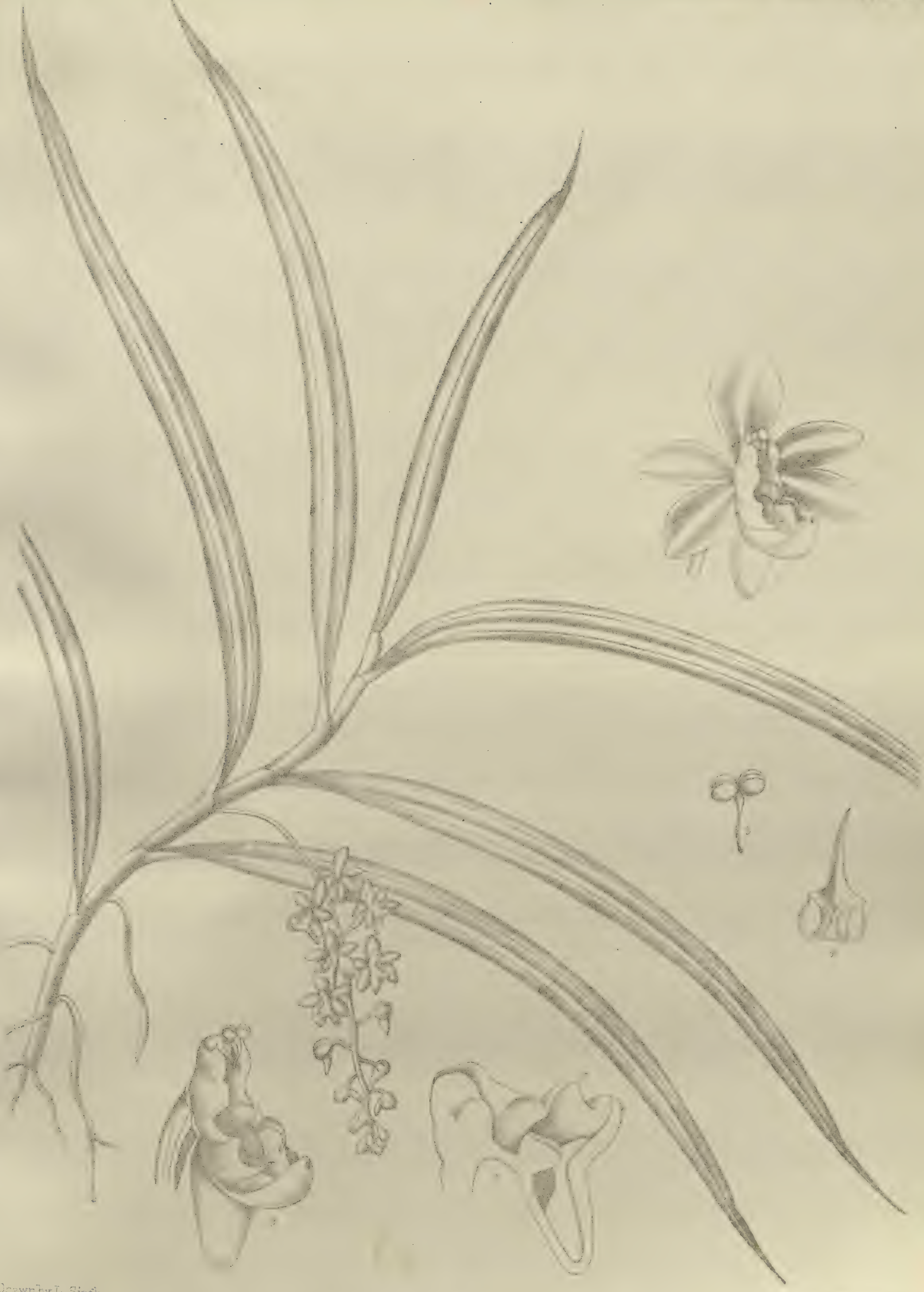
Lith by [illegible]

SACCOLABIUM TENUICAULE. Hook. f.

Drawn by [illegible]

Lith. by [illegible]

[illegible]ILARIUM TRICHROMUM, Rchb. f.



Drawn by L. Singh.

Lith. by Chitra Silpi C°.

Drawn by G. C. Dass.

Lith. by A. C. Mukerjei.

SARCANTHUS INSECTIFER, Reichb. f.

Lith: by Chitra Silpi C°.

SARCANTHUS PALLIDUS, Lindl.

Drawn by G. C. Dass

CLEISOSTOMA BREVIPES, Hook.f.

Drawn by [illegible]

Lith: by A. C. Mukerjie

CLEISOSTOMA SPICATUM, Lindl.

Drawn by G. C. Dass anal. by Hooker.

Lith. by A. C. Mukerjei.

CLEISOSTOMA UTERIFERUM, Hook.f.

CLEISOSTOMA WENDLANDORUM, Reichb.f.

CLEISOSTOMA MANNII, Hook.f.

Drawn by G. C. Dass.

CLEISOSTOMA BICUSPIDATUM, Hook. f.

Lith. by Chitra Silpi C°.

HERPYSMA LONGICAULIS, Lindl.

Drawn by [illegible]

ODONTOCHILUS LANCEOLATUS, Benth.

Lith by Chitra Silpi Co

GOODYERA FOLIOSA, Benth.

POGONIA SCOTTII, Reichb. f.

POGONIA CARINATA, Li

Drawn by G. C. Dass.

Lith. by B. K. Roy.

HABENARIA STENOPETALA, Lindl.

Lith. by B. K. Roy.

HABENARIA STENOPETALA, Lindl. VAR. P...YTRICHA, Hook. f.

Drawn by G. C. Dass Lith. by Chitra Silpi Co.

HABENARIA ARIETINA, Hook. f.

Drawn by G. C. Dass.

HABENARIA GENICULATA, Don.

Lith. by Chitra Silpi Co.

Lith by K. D. Chundra

HABENARIA TRIFLORA, D.

Lith by Chitra Silpi Co.

Drawn by J. Singh.

HABENARIA HELFERI, Hook. f.

Lith. by [illegible]

Plantam delt A. L. Singh
partes anal. lineis
descripsit P. Brühl.

THALICTRUM CULTRATUM, Wall.
SUBSPECIES I. II. et III.

Lith. by K. I. Das

Lith: by A. C. Singha.

Plantam del. H. Dass; partes sectas lineis descripsit P. Smith.

CLEMATIS MONTANA, Ham.

CLEMATIS ACUMINATA, D.C.

Lith. by Chitra Silpi

Plantae del. .. A. ..owdhary; partes sectas lineis descripsit P. Brühl.

(A) ANEMONE GRIFFITHII, H. f. et T.
(B) A. FALCONERI, T. (C) A. RUPESTRIS, Wall.

Lith by A. C. Mukerjee

Mukerjei

ANEMONE OBTUSILOBA, Don.
(A) SUBSP. TRULLIFOLIA, (Hf. et T.)
(B) SUBSP. OVALIFOLIA, P. B.

Stirpes et partes sectas ineis descripsit P. Bruhl.

(A) ANEMONE RUPESTRIS, Wall in Herb. Calc.
(B) ANEMONE DEMISSA, H.f. et T.

Lith. by A. C. Mukerjea.

Stirpem delt A. L. Singh; partes sectas lineis describsit P. Brühl.

Lith. by A. C. Mukerjei.

ANEMONE ELONGATA, Don.

ADONIS BREVISTYLA, Franchet.

Var. *trichocarpa.*- P.B.

Lith: by New Chitra Silpi

RANUNCULUS AUCHERI, Boissier.
(A) subsp. typica, var. persica; (B) var sikaramensis, P.B; (C) subsp. hariabensis, P. B.

Stirpes atque partes sectas
lineis descr.t Paul Bruhl

RANUNCULUS AFGHANICUS,
Aitch. et Hemsl.

Lith: by Chitra Silpi Co.

Ann. Roy. Bot. Gard. Calcutta, Vol. 5, PLATE 111.

Lith. by A. C. Mukerjei.

ACONITUM FEROX, Wall.;
(A) Subsp MOSCHATUM, P. Brühl.

Stirpem et partes sectas
lineis descripsit P. Brühl.

CALATHODES PALMATA, H.f. et T.

Lith by S.C. Mondul.

Ann. Roy. Bot. Gard. Calcutta, Vol. 5, PLATE 113.

Stirpem delt A. D. M[illegible]:
partes sectas [illegible]
descripsit P. Brühl.

TROLLIUS PUMILUS,

Lith by A. C. Singha.

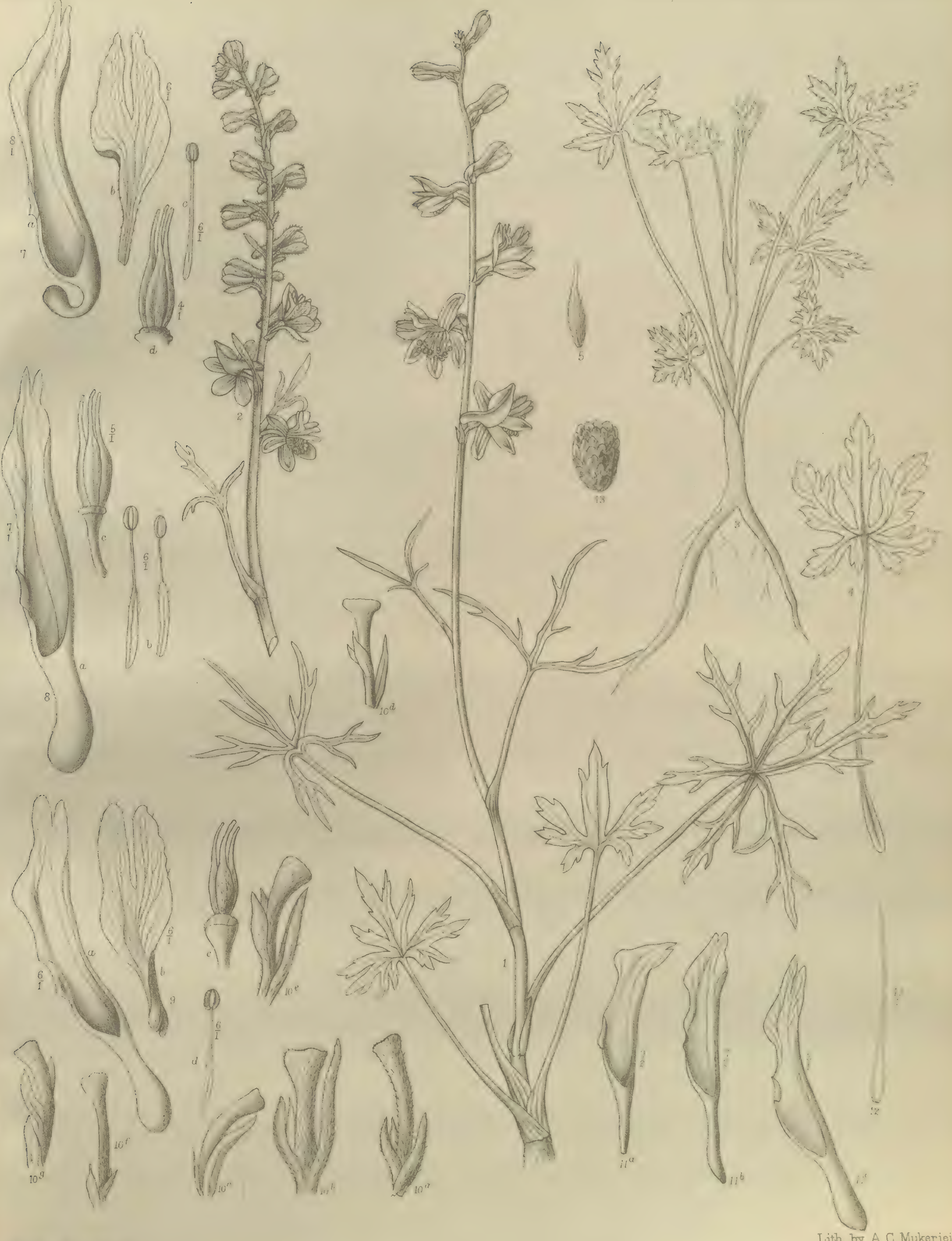
Stirpem delt A. L. Singh.
partes sectas lineis
descripsit P. Brühl

COPTIS TEETA, Wall.

Lith. by A. C. Singha.

Lith by A. C. Singha.

COPTIS OSPRIOCARPA, P.B.



Stirpem delt A. Mollah; reliquas partes lineis descripsit F. Brühl.

Lith. by A. C. Mukerjei.

DELPHINIUM UNCINATUM, H.f. et T.

DELPHINIUM SANICULAEFOLIUM, Boiss.

Lith. by B.

Lith. by A. C. Mukerjei.

DELPHINIUM GRANDIFLORUM, Lin.

Stirpes delt. G. C. Dass, partes sectas lineis descripsit P. Brühl

Lith. by A. C. Mukerjei

DELPHINIUM INCANUM. Royle.
SEMINA DELPHINIORUM INDICORUM.

Stirpes acpartes sectas lineis descripsit P. Brühl.

DELPHINIUM ALTISSIMUM, Wall.
(A) subsp. typicum, var. phallutense, P. B.;
(B) subsp. drepanocentrum P. B.

DELPHINIUM STAPELIOSMUM, P.B.

Lith: by A.C. Chowdhary.

Plantam delt. Abdul Mollah,
partes sectas lineis,
descripsit P. Brühl.

Lith. by A. C. Mukerjei

DELPHINIUM DENSIFLORUM, Duthie.

DELPHINIUM VISCOSUM, H.f. et T.

Lith. by A.C. Singha.

ACONITUM LURIDUM, H.f. et T.

Plantam delt. G.C Dass.
partes sectas lineis
descripsit P. Brühl.

Lith. by A. Muke. [illegible]

ACONITUM GYMNANDRUM, Maxim.

[illegible]

PAEONIA MOUTAN, D.C.

[illegible]

Lith. by Chitra Silpi Co.

P. Brühl lineis descripsit.

Lith. by S.C. Mondul.

DELPHINIUM SPECIOSUM, M.Bieb.
subsp. RANUNCULIFOLIUM, Wall.
(A) var. thyrsantha, P.B. (B) var. katatricha, P.B.

Stirpes etque partes sectas
[illegible] discripsit P. Brühl

DELPHINIUM PACHYCENTRUM, Hemsl.
(A,a) subsp. Hemsleyi; (B,b) subsp tsangense, P.B.

Lith. by A.C. Chowdhary.

Drawn by A. L. Singh.

Lith. by A.D. Molla.

TETRACERA GRANDIS, King.

Drawn by G. Das.

Lith by Chitra Silpi Co.

WORMIA MELIOSMÆFOLIA, King.

Drawn by A. L. Singh.

COCCULUS KUNSTLERI, King.

Drawn by A. D. Molla.

Lith. by K. P. Dass.

CYCLEA ELEGANS, King.

CLEOME HULLETII, King.

CAPPARIS GALLATLYI, King.

Drawn by A.L. Singh.

Lith by K. H. Das.

Drawn by

Lith. by A. C. Sinha

CAPPARIS LARUTENSIS, King.

Drawn by A. L. Singh.

Lith. by A. D. Molla.

CAPPARIS SCORTECHINII, King.

Drawn by K. P. Dass.

CAPPARIS CUCURBITINA, King.

Lith. by A. D. Molla.

Drawn by K. P. Dass.

Lith. by A. C. Mukerjei.

CAPPARIS ANDAMANICA, King.

Drawn by D. N. Chowdory. Lith. by K. H. Das.

CAPPARIS AMBIGUA, Kurz.

ROYDSIA SCORTECHINII, King.

Drawn by G. C. Dass. ALNODEIA MEMBRANACEA, King. Drawn by K. P. Dass. ROYDSIA FASCICULATA, King. Lith by A. D. Mullik.

Drawn by A. P. M[illegible]

Lith. by A. L. Singh.

ALSODEIA KUNSTLERIANA, King.

A. ALSODEIA HOOKERIANA, King. Drawn by D. N. Chowdhury.

B. ALSODEIA WRAYI, King. Drawn by A. L. Singh.

ALSODEIA CINEREA, King.

Drawn by K. P. Dass.

Lith. by A. C. Mukerjei

ALSODEIA FLORIBUNDA, King.

Drawn by A. D. Molla.

Drawn by A. [illegible] Molla.

ALSODEIA SCORTECHINII, King.

Lith. by A. D. Molla.

Drawn by G. C. Dass.

ALSODEIA CONDENSA, King.

Lith. by K. D. Chandra.

Ann. Roy. Bot. Garden, Calcutta. Vol 5 PLATE 146.

Drawn by A. L. Singh. ALSODEIA CAPILLATA, King. Lith. by A. C. Sanyal.

Drawn by K. P. Dass. ALSODEIA COMOSA, King.

Drawn by D. N. Chowdhury.

Lith by Chitra Silpi C°.

HYDNOCARPUS NANA, King.

Drawn by G. C. Dass.

Lith: by P. N. Sinha.

HYDNOCARPUS CURTISII, King.

Drawn by A. D. Molla.

Lith: by K. D. Chandra.

HYDNOCARPUS CUCURBITINA, King.

Drawn by A. L. Singh.

Lith: by Chitra Silpi Co.

HYDNOCARPUS WRAYI, King.

Drawn by K. P. Dass.

Lith. by K. P. Dass

HYDNOCARPUS ILICIFOLIA, King.

Drawn by A.D. Molla.

Lith: by K.D. Chandra.

TARAKTOGENOS KUNSTLERI, King.

Ann. Roy. Bot. Garden, Calcutta, Vol. 5, PLATE 153.

Drawn by D. N. Chowdhury.

Lith: by Chitra Silpi Co.

RYPAROSA CAESIA, Blume.

Drawn by A. D. Molla.

RYPAROSA KURZII, King.

Lith: by P. N. Sinha.

Drawn by G. C. Dass.

Lith. by, A. C. Mukerjei.

RYPAROSA WRAYI, King.

Lith: by A. C. Si

RYPAROSA SCORTECHINII, King.

Drawn by A.L. Singh.

Lith by K. H. Das.

RYPAROSA KUNSTLERI, King.

Ann. Roy. Bot. Garden, Calcutta, Vol. 5, PLATE 158.

Drawn by G. C. Dass.

Lith: by Chitra Silpi Co.

RYPAROSA FASCICULATA, King

Drawn by A. D. Molla.

Lith. by Chitra Silpi Co.

TRIGONIASTRUM HYPOLEUCUM, Miq.

Drawn by D. N. Chowdhury

Lith. by Chitra Silpi Co.

XANTHOPHYLLUM ANDAMANICUM, King.

Drawn by A.L. Singh.

Lith by K.H. Das.

XANTHOPHYLLUM WRAYI, King.

Drawn by G. C. Dass

Lith. by A. C. Mukerjei

XANTHOPHYLLUM KUNSTLERI, King.

Lith: by A. L. Singh

XANTHOPHYLLUM SCORTECHINII, King.

Drawn by K. P. Dass.

Lith: by A.C. Singha.

XANTHOPHYLLUM PULCHRUM, King.

Drawn by K. P. Dass.

Lith: by A. L. Singh.

CRATOXYLON MAINGAYI, Dyer.

Drawn by A. D. Molla

GARCINIA OPACA, King.

[illegible] by [illegible]

Drawn by A. D. Molla.

GARCINIA KUNSTLERI, King.

Lith: by A. D. Molla.

Drawn by K. P. Dass.

Lith: by K. P. Dass.

GARCINIA WRAYI, King.

Drawn by G. C. Dass.

Lith. by Chitra Silpi Co

GARCINIA ANDAMANICA, King.

Drawn by K. P. Dass.

CALOPHYLLUM PRAINIANUM, King.

Lith. by A. C. Singh

Drawn by D. N. Chowdhury

Lith by A. L. Singh

CALOPHYLLUM SUBSESSILE, King.

Ann. Roy Bot. Garden, Calcutta, Vol. 5, PLATE [illegible]

Drawn by G. C. Dass.

KAYEA GRANDIS, King.

Lith. by E. K. Roy

Drawn by K. P. Dass

Lith: by K. D. Chandra.

KAYEA KUNSTLERI, King

KAYEA MANII, King.
Drawn by D.N. Chaudhury.
KAYEA CURTISII, King.

Drawn by G. C. Dass. Lith. by A. D. Molla.

TERNSTRŒMIA SCORTECHINII, King.

Ann. Roy. Bot. Gard. Vol. 5,

Drawn by A. L. Smith.

PYRENARIA KUNSTLERI, King.

PYRENARIA WRAYI, King.

GORDONIA MAINGAYI, King.

Drawn by K P Pal. Lith. by A. D. Molla.

GORDONIA IMBRICATA, King.

Drawn by A D Molla.

A
GORDONIA MAINGAYI, King.
Drawn by K.P.Dass.
Lith by A.D. Molla.
GORDONIA IMBRICATA, King.
Drawn by A.D. Molla.

Ann. Roy. Bot. Gard. Calcutta, Vol. [illegible] Pl. [illegible]

Drawn by A. [illegible] Molla.

Lith: by A. L. Singh

[illegible]ROCARPUS KUNSTLERI, King.

D. N. Chowdhary delt.

A. C. Chowdhary lith

VATICA PERAKENSIS, King.

B

Drawn by A. L. Singh.

Lith by A. L. Singh.

PENTACME MALAYANA, King.

Drawn by G. C. Lass

Drawn by D N Chowdhury.

Lith by A D Malla.

SHOREA KUNSTLERI, King.

HOPEA CURTISII, King.

SHOREA CILIATA, King.

G. C. Dass delt.

SHOREA THISELTONI, King.

Lith: by A. C. Chowdhary.

Drawn by K. P. Dass.

Lith: by K. P. Dass.

RETINODENDRON SCORTECHINII, King.

BALANOCARPUS CURTISII, King.

Drawn by K. P. Dass. Lith. by K. P. Dass.

BALANOCARPUS PENANGIANUS, King.

Drawn by G. C. Dass.

Lith: by A. D. Molla.

BALANOCARPUS MAXIMUS, King.

Drawn by A. L. Singh.

Lith: by G. C. Dass.

BALANOCARPUS HEMSLEYANUS, King.

Drawn by D. N. Chowdhury.

Lith: by K. P. Dass.

PACHYNOCARPUS STAPFIANUS, King.

Drawn by K. P. Dass.

Lith: by A. L. Singh.

ARISTOLOCHIA CURTISII, King.

PRAINEA SCANDENS, King.

Drawn by G. C. Dass. Lith: by K. P. Dass.

HULLETTIA DUMOSA, King.

Drawn by R. Pantling.

HEMIORCHIS PANTLINGII, King.

Lith: by A. L. Singh.

Drawn by R. Pantling. Lith. by A. C. Chowdhary.

HEMIORCHIS PANTLINGII, King.

Drawn by D. Prain.

MILULA SPICATA, Prain.

Lith. by New Chitra Silpi Co.